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Original Communications

THE FUNCTION OF THE HOFBAUER CELLS OF THE CHORIONIC VILLUS PARTICULARLY IN RELATION TO ACUTE INFECTION AND SYPHILIS

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IN my monograph, *The Biology of the Human Placenta,* which appeared in 1905, I described in detail certain cells which constitute a characteristic feature of the connective tissue core of the chorionic villus during the first half of pregnancy, and which have since been referred to as Hofbauer cells. "These specific cells make their appearance by the end of the fourth week of pregnancy. They are comparatively abundant in the early stages of the placenta and decrease in number later on, as the connective tissue of the villus gradually assumes a more fibrous character. The duration of life of the individual cells is shown by the fact that they vanish after total vacuolization. In the cytoplasm which primarily contains homogenous or delicate granules, minute pellucid spots gradually appear about the periphery of the nucleus; later increase in size, and form a clear area surrounding it. These spaces which are filled with fluid and are separated from one another by thin septa, may fuse together, and thus give rise to larger vacuoles. Similar foam-like structures subsequently occur in the peripheral zone of the cells, as well. Furthermore, an essential part of the cytoplasm is represented by smaller and larger granules. In the beginning, these cells are intimately connected with the stroma cells of the villi and are to be considered as descendants of the original mesenchyme. Marchand holds the same view. Staining fresh placental tissue with neutral red throws the

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vacuolated cells into the boldest relief, while the surrounding tissue remains unstained. It is the granules and the vacuoles of the cells which take up the dye with avidity. These are the fundamental structural constituents of the cells in question, and they may play a considerable biologic part. As to their physiologic rôle, we can only say that they probably possess a digestive function,—a view which is supported by the presence of fat in the vacuoles, as well as of neutral red. The phagocytic power is further supported by the fact that at the stage of development, when the nucleated red blood cells lose their nuclei, I could demonstrate the disintegration of their nuclei within the fetal capillaries of the chorionic villi, and that the fragments of the nuclei were engulfed by the cytoplasm of a type of cells quite comparable in structure to our vacuolated cells. As this

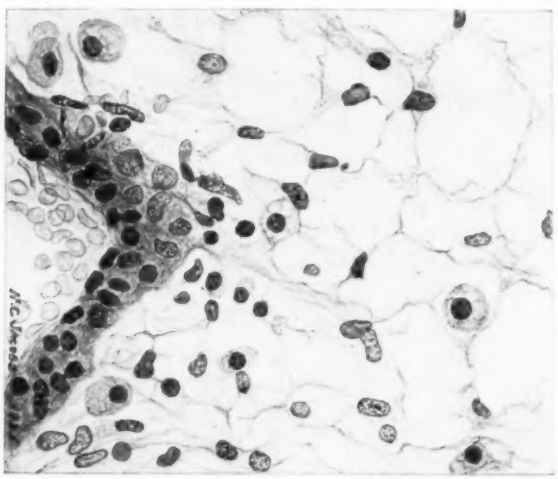

Fig. 1.—Section through normal villus at third month, showing Hofbauer cells.

phenomenon could be observed distinctly in various specimens, it became obvious that our cells may be regarded as wandering cells, which had gained access to the fetal blood stream, and thereby constituted a portion of its white cells." (Fig. 1.)

A further contribution to the function of the cells in question was afforded by my observation that they possess an elective capacity for the storage of lithioncarmin after vital staining with that dye. As it has been shown by Kiyono, the Kupffer cells of the liver, the reticuloendothelial cells of the spleen, the lymph glands, and the bone marrow, as well as the clasmatocytes of the connective tissue display an elective affinity for this substance. That author infers from his investigations that all these types possess a functional relationship, as they not only store up vital dyes, but also other materials, especially fats and pigments, and are concerned in cellular phagocytosis, as well as in the metabolism of fatty substances. Furthermore, these

cells possess a remarkable ability to reproduce themselves after some of them have disintegrated. When inflammation occurs, in the above-mentioned organs, all of the cells show a similar reaction and give rise to ameboid phagocytic polyblasts.

W. A. Meyer, in his extensive studies on the anatomic changes observed in the aborted human ovum, discusses in a special chapter the characteristics and the significance of the Hofbauer cells. He found them within the connective tissue core of the villus,—never engorged with erythrocytes, or pigmented. Nevertheless, he admits that if the Hofbauer cells arise from mesenchyme cells, it stands to reason that at least they may be potentially phagocytes, and quotes Acconci, who holds that such cells probably produce a special internal secretion. In view of the general appearance of the cells and their marked affinity for neutral red, Warren H. Lewis recently emphasized their identity with clasmatocytes and surmised that they may have a phagocytic character. He also showed that in tissue cultures the cells exhibit marked ability to ingest and to digest bacteria and other foreign bodies, such as red blood cells, cellular débris, etc.

Unfortunately the biologic rôle of these cells cannot be approached by experiments on animals; since, so far as data are at hand, we know that they are characteristic constituents of the human placenta. Nevertheless, careful studies of their behavior under certain pathologic conditions may furnish valuable information, especially when compared with similar observations upon equivalent cell groups under well-known experimental conditions.

As mentioned, the Hofbauer cells exhibit a striking likeness to clasmatocytes, and therefore, it seemed to me that it might be interesting to study their behavior in the presence of certain infections which occur in the maternal organism, more particularly because during the past few years intense interest has been focused upon the function of the clasmatocytes; recent work having attributed to them a great value in the disposal of bacteria. We shall refer later to the leading articles concerning their significance in inflammatory processes, particularly to the production of local immunity and shall mention here only the original work of Ranvier and Cornil, who emphasized that in artificially produced inflammation, the clasmatocytes hypertrophy, lose their processes, and become more rounded in outline. They claim that these cells display marked phagocytic activity and consequently attribute phagocytic and secreting activity to them.

For the sake of uniformity, I shall hereafter refer to the specific cells of the placenta ("Hofbauer cells" or "clasmatocytes") as histiocytes or reticulum cells, thereby emphasizing their apparent similarity to the groups of cells mentioned above. My interest has been concentrated upon the histologic changes which these cells undergo in abnormal conditions and particularly upon the question as to how

they react in syphilitic infection. Since such extensive material was at my disposal I was able to draw conclusions from a very large number of specimens.

Histologic studies of the syphilitic placenta have been carried out by numerous authors. E. Fraenkel first called attention to a specific increase of cells within the core of the villus and designated the process as a "deforming growth of granular cells." His statements have been subsequently substantiated by several writers. Hitschmann and Volk in the large amount of material at their command found round cells predominating but they did not consider the changes as specific, since they might also be present in cases of chronic nephritis, although in less abundance. Seitz holds that the closely packed round cells originate from the endothelium of the fetal capillaries, while Williams was the first to point out that the change consists in the presence of closely packed round or oval cells which result from a proliferation of the stroma cells, which lose their normal stellate appearance and become round or oval in shape. De Lee considers that the villi are obliterated by an overgrowth of white cells, while Bumm calls the change a small round-cell infiltration. Accordingly, despite an extensive literature on the subject, the origin of the new elements can by no means be considered as settled.

In great part, I owe the ability to carry out the present work to the fact that since the organization of the obstetrical department of the Johns Hopkins Hospital, all placentae have been subjected to routine microscopic examination. This has made possible the accumulation of sections from 450 syphilitic specimens during the past ten years. Since the incidence of fetal syphilis is now relatively rare in this service, due to careful prenatal care which includes the efficient antisyphilitic treatment of every pregnant woman presenting a positive Wassermann reaction, the number of syphilitic children and placentae have been so reduced that my investigations would not have been possible had the above collection not been available.

Soon after taking up this work, I realized that a proper understanding of the histologic changes encountered in the syphilitic placenta could not be reached without considering the alterations which occur in the chorionic tissue under the influence of frank acute infection. With this in mind, I have studied the cases of acutely infected abortion occurring prior to the fifth month, the greater part of which had resulted from criminal interference. In some cases, the patients asserted that shortly after intrauterine manipulation, fever had set in and was frequently associated with chills. In other cases, the history stated that after a sudden fall, fluid and blood had escaped and that subsequently fever made its appearance; but experience teaches how cautious one must be in evaluating such assertions. The study of sixteen cases of this character shows that

definite changes occur within the core of the chorionic villus and especially in the cells which we are considering, the most striking feature being a marked increase in their number. For the most part, the cells were scattered evenly throughout the stroma, while in other cases, they had accumulated in the peripheral zone of the villi. Moreover, a considerable increase in the amount of the cytoplasm of the individual cells, as well as the occurrence of binucleated cells, was noted.

In order to become acquainted with the peculiarities of the cells in question, I think it best to describe and picture the findings in two specimens; the first being an acutely infected, the other a subacutely infected abortion. In the first instance, the five months' pregnant patient had begun to bleed five days previously, and had suffered from fever associated with chills for four days. On admission the membranes were found to be ruptured, and the fetus and placenta were passed four and six hours later, respectively. Microscopic examination (Fig. 2) showed that the histiocytes were very abundant and were evenly scattered throughout the villus. Roughly speaking they were three times more numerous than normally, and while they usually lay isolated in the meshes of the connective tissue framework, in places two cells could be seen to be in contact. The cells were generally round in outline, but in some instances they were oval or approximately triangular and were frequently connected with the connective tissue fibers by means of delicate filaments. The cytoplasm included numerous vacuoles which occupied the zone immediately surrounding the nucleus, or filled out the entire cell. In the latter event, huge vacuoles could occasionally be seen at the periphery and the entire cell appeared to be from two to three times the usual size, measuring 30 or 32μ in diameter. In most instances the nucleus occupied an excentric position. Mitosis occurred very rarely, although cells with two nuclei could be seen in several places. When this was the case, both of the nuclei lay close together and the cytoplasm appeared to offer the usual dimensions or to be slightly increased in amount. In addition to the presence of reticulum cells, both the chorion and amnion presented the usual signs of moderate inflammation.

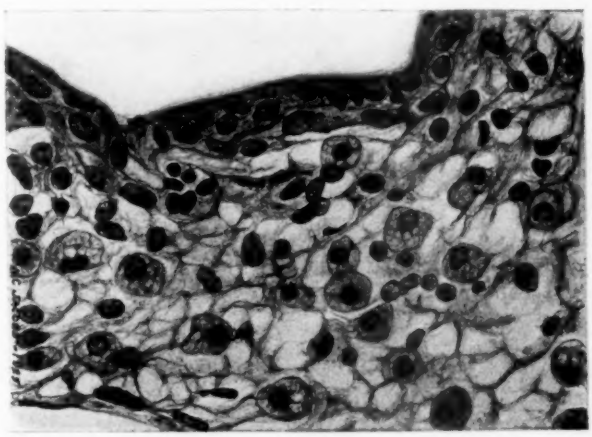

Fig. 2.—Villus from infected abortion at fifth month, showing increase in number of Hofbauer cells.

In the second case, the patient was in the fourth month of pregnancy, had bled for the previous five weeks and had fever for the previous ten days. On admission the temperature was 103° F., and the somewhat macerated fetus and placenta were removed manually. Upon microscopic examination, the core of the chorionic villus was found to be composed of cells, which for the most part were polygonal in form (Fig. 3). Since the cells lay in close proximity to one another and thus seemed more prominent, the connective tissue fibers appeared less conspicuous than usual; while in places they were obscured by a solid mass of cells. The outline of the cells was generally smooth, although slender or more blunt processes might project from it. In some instances the protoplasm stained uniformly, while in others, it showed a perinuclear zone of vacuolization. Undoubtedly, but rarely, mitosis occurred. Binucleate cells were not uncommon, and here and there two cells, whose boundaries were to some extent still distinctly outlined, could be seen to have undergone partial fusion; while occasionally, one of the two nuclei

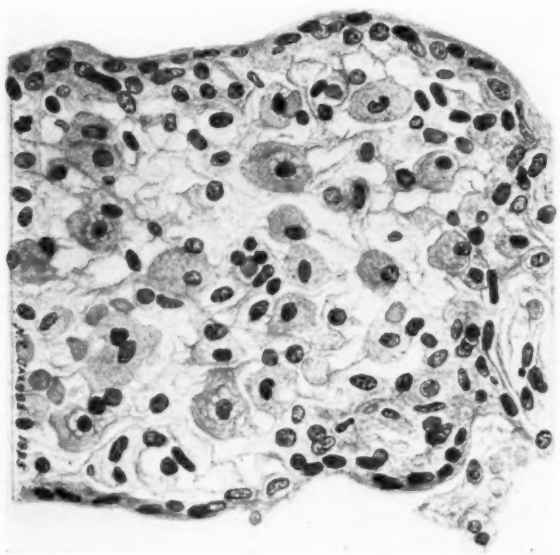

Fig. 3.—Villus from subacute infected abortion at fourth month.

had undergone chromatolysis, leaving only a nuclear membrane. Multinucleated cells could also be seen, the nuclei being oval in outline. In addition to these changes, the decidua was infiltrated in places with leucocytes.

Passing on to the syphilitic placenta, we must bear in mind that there are essential differences in the various specimens according to the time which has elapsed between the occurrence of infection and the expulsion of the placenta, and that these differences are further complicated by the changes resulting from the death of the fetus *in utero,* superimposed upon the vascular changes which developed in the living child. Thus, within villi which no longer contain vessels, or show only obliterated capillaries, the connective tissue changes are emphasized at the expense of the histiocytes. Eventually, we encounter a dense fibrillar structure in which the reticulum cells have

been pushed into the background. It is a common feature of the syphilitic placenta that the connective tissue framework appears increased. The stroma cells expand and proliferate, their processes grow thicker and branch out, and after a time, they resemble fibroblasts in appearance. In other words, we have to deal with a progressive development of the connective tissue which eventually results in a scar-like structure, lacking vessels. Although considerable differences may be noted in the various specimens with respect to the stroma and although the features just mentioned are uniformly characteristic of the syphilitic villus, it is the histiocytes which give it its most striking characteristics. In many instances these cells display the same general features as I have described in the subacutely infected abortion, although the vacuoles within the cytoplasm are sometimes very conspicuous. I have definitely seen evidence of mitosis, but it only rarely occurs, while in several places binucleated, or even multinucleated, cells may be observed.

Another way in which the cells sometimes make their appearance within the core of the syphilitic villus is represented in Fig. 4. This placenta belonged to a macerated child, prematurely stillborn at seven and one-half months, which showed numerous spirochetes in its organs. The connective tissue framework of the chorionic villus is built up of stroma cells, which in several places take on the features of fibroblasts. Within this framework characteristic histiocytes can be clearly seen. Some of them show an increased protoplasm, here and there contain vacuoles, which are sometimes so abundant as to give the cytoplasm a frothy appearance. The nuclei stain quite dark, are round, oval or kidney shaped, and occupy a more or less excentric position, containing within the delicate intranuclear network distinctly marked chromatin granules. Some of the cells possess two nuclei, or may even be multinucleated, while in places it can be seen that two histiocytes fuse together and give rise to a binucleated cell. Such cells have an abundant protoplasm and ragged outlines and are sometimes very conspicuous, attaining a diameter of 45 ot 52 μ.

This type of cell reminds one very closely of the elements which have been observed by Maximow in living tissue, when lymphoid tissue has been cultivated for two or more days. The point upon which I wish to lay stress, however, is that by studying our various specimens it has become evident that all transitional stages can be demonstrated from the original reticulum cell to the polyblast, or even to the large binucleated cell. In order to clear up the origin of the peculiar elements which we regard as characteristic of the syphilitic villus, a statement concerning the gradual transformation of the transitional type of cell appears essential. Furthermore, the significance of the response of the reticulum cells is supported by the fact that in the adult organism, the changes occurring within the lymph glands

in syphilis consist essentially in an increase in the number of lymphocytes, and especially of the larger mononuclear cells, which fill the sinuses and are often phagocytic, and which are regarded by most writers as endothelial or reticulum cells (MacCallum).

Since repetition concerning the occurrence of vacuoles within the protoplasm of the cells under consideration has been unavoidable, a brief note as to the significance of their appearance seems called for. The question arises whether vacuoles appear when the cell is stimulated to activity, or whether they should be regarded as signs of de-

Fig. 4.—Villus from syphilitic placenta at eighth month, showing Hofbauer cells and fibroblasts.

generation. Since I have stated that they vary very greatly in size, and nevertheless take up neutral red with avidity, I am led to believe that such variations in size indicate different functional states of the cells. As Shipley has shown in clasmatocytes of a similar type, it would appear that the vacuoles have a digestive function, being called "the segregation apparatus" of the cell, by Evans and Scott. Moreover, it has recently been shown by several writers, Maximow, Seidlin, and others, that phagocytosis and the influence of bacteria may account for the development of vacuoles in mesenchymal cells. On the other hand, a complete vacuolization, when the nuclei present signs of

disintegration, shows it to be correlated with degenerative processes, and such a conception parallels that advanced by F. R. Sabin concerning the monocytes of the human blood.

Turning to another side of the question, I desire to present the findings in a series of cases, in which the patient had been subjected to routine treatment by diarsenol immediately following the demonstration of a positive Wassermann reaction in the early months of pregnancy and had given birth to living children at term. Such cases are designated in the departmental collection as "Wassermann positive, placenta normal." Upon careful examination of 390 such placentae, I found that in 65 cases (16 per cent) a definite accumulation of reticulum cells could be demonstrated in the villi here and there, and such findings are well illustrated by Fig. 5. In this instance (O.O.S. 11010), the patient had received 13 injections of diarsenol dur-

Fig. 5.—Villus from full term placenta from patient treated by 13 injections of diarsenol and giving birth to normal child. Note Hofbauer cells.

ing pregnancy and presented a negative Wassermann at term. We shall later discuss these findings and how they may be accounted for.

My investigations show that under the influence of acute or subacute infection, definite changes occur in the connective tissue of the chorionic villi. In acute infected abortion the first phenomenon observed is an increase in the number of reticulum cells. In some instances they are distributed evenly throughout the villus, but in others, a distinct accumulation of the cells occurs in the peripheral zone of the villus and I have already discussed the changes occurring in the cytoplasm and nuclei.

Furthermore, I might add that a similar phenomenon can likewise be observed in certain specimens of tubal pregnancy, in which well preserved villi dip into extravasations of blood.

Having become acquainted with the variations which occur in acutely infected cases, we shall now consider the changes which occur

within the core of the villi in the presence of syphilitic infection. In analyzing our findings, it is necessary to distinguish between different stages of tissue reaction. While our observations on acute infections were mostly made upon placentae from the first five months of pregnancy, syphilitic placentae from the various months of pregnancy were studied. In the latter, we find a number of cells which exhibit the characteristics of the specific reticulum cells of the chorionic villus. At the same time, we also meet with new types of cells, which have been described at length by several investigators, who, however, have not adduced satisfactory proof as to their origin or significance. Careful study on our part has revealed a close relationship between them and the reticulum cells. This tissue is composed of comparatively large cells, round or polygonal in outline and including an oval or kidney-shaped nucleus with a delicate intranuclear network, and which sometimes divide by mitosis. In various instances the transition between them and reticulum cells with vacuolated protoplasm, can be readily followed, the former exhibiting the characters of polyblasts, or to some extent of epitheloid cells. Interpolated between them are cells of another type,—that is, spindle-shaped elements, whose large nucleus contains two or more irregularly spotted nucleoli. These cells remind one very closely of proliferating fibroblasts, and now and again show signs of mitosis. Our observations seem to justify the conclusion that the whole complex of cells within the core of the syphilitic villus can be traced back to two sources,—partly to the reticulum cells, and partly to the stroma cells which have become converted into fibroblasts.

In order to assure a proper interpretation of our results, I would refer to the work of Maximow, who has emphasized the important rôle which is played by clasmatocytes and reticulum cells during inflammation. In a recent paper in the *Physiological Reviews* (1924), he emphasizes the fact, that the so-called histioid "wandering" cells of the mesenchyme are endowed with manifold potentialities of development, and are able to proliferate and to become differentiated into various other forms. Upon stimulation, they become mobilized and are transformed into active phagocytes. Under this heading, he includes the clasmatocytes of the connective tissue, as well as those of the lymph glands, and the reticulum cells of the bone marrow and the spleen. The same holds true for the Kupffer cells of the liver, and similar conditions probably exist in the sinuses of such endocrine glands, as the adrenals. In the resting, as well as in the free condition, the cells may act as phagocytes and take up certain materials. That they store up dyes and colloidal metals has been shown by Goldmann, Evans, and Kiyono, who designate them as histiocytes or tissue macrophages. They likewise frequently store up lipoid substances. Indeed, it would appear that this vast group of elements constitutes a single

entity, with a very prominent function in the body, which is sometimes referred to as the "reticuloendothelial system" (McNee).

Recent experimental work indicates clearly that the cell species which make up the reticuloendothelial apparatus are most active in the production of antibodies. Bieling, who has done extensive research work in this field, maintains that the elaboration of antibodies is to be looked upon as an internal secretory function of the cells in question, and that the substances so formed gain direct access to the blood stream and act like hormones of the ductless glands. In various experimental conditions, especially after the intravenous injection of particular matter, or of colloidal solutions of vital dyes, the whole reticuloendothelial system enters a phase of functional stimulation. If inflammation occurs in blood-forming tissue, the reticulum cells—the local histiocytes—are readily mobilized and become transformed into polyblasts, which remain in the newly formed connective tissue as free histiocytes, or later form epithelioid, or even giant cells.

In another paper Maximow, by the aid of tissue culture methods, attacks the problem of the relation between tissue elements and pathogenic bacteria, and draws the interesting conclusion that in cultures of lymphoid tissue inoculated with tubercle bacilli, the chief rôle is undoubtedly played by the reticulum cells and that wherever they meet the bacilli, phagocytosis promptly occurs. Another specific result of infection is mitosis, as well as a peculiar hypertrophy of the cells which often attain astounding proportions. Moreover, the hypertrophying reticulum cells exhibit a tendency to cluster together, and all of these properties are attributed to a specific chemical stimulation originating in the tubercle bacilli. Indeed, the histiocytes may even be influenced at a distance without coming in direct relation with the bacilli. That histiocytes are responsible for the production of polyblasts and epithelioid cells, has likewise been shown by Evans, Bowmann and Winternitz, who have traced the cells back to the fixed local elements of the various organs. Again, Maximow lays stress upon the point, that in active tissue cultures of various types of connective tissue practically the same cell transformations can be observed as in inflammation, the fibroblasts forming the basis of the new tissue and the histiocytes becoming phagocytic.

In view of the experimental data just adduced, one may be justified in concluding that the well-known cellular changes within the core of the syphilitic villi represent a response of its specific elements to spirochetes, and that histiocytes after being transformed into polyblasts and epithelioid-like cells constitute the essential constituents of the new tissue, while the fibroblasts remain less numerous. In other words, the placental changes may be regarded as a cellular defense mechanism. My observation that an increase in the size of the histiocytes constitutes one of the first reactions of placental tissue to in-

fection is in accord with the view that surface energy plays an important rôle in phagocytosis. This phenomenon has engaged the attention of many investigators, who have shown that the activity of certain reticuloendothelial structures in storing up bacteria, fragments of red blood cells, as well as colloidal metals, is definitely connected with an increase in the surface of the respective protoplasm. Since the histiocytes of the chorionic villi represent active mesenchyme, it would seem that the human placenta is capable of developing a subtle defensive mechanism so that microorganisms, after passing the first barrier of the chorionic epithelium must meet a second line of defense made up of cells which may react at a distance. In the adult, the tissue which most closely resembles embryonic mesenchyme is the reticulum connective tissue, which strangely enough arises comparatively late in embryonic development. If this conception is correct, placental tissue may be assumed to possess functions similar to those of the lymph glands, the hemolymph glands, and the bone marrow. As I pointed out in my work on fetal nutrition, both the placenta and the fetal body represent a single unit and it need hardly be stated that they work jointly. Accordingly, the placenta not only plays a most important part in the nutrition of the fetal organism but also, acting as an advance guard, protects it to some extent against bacterial infection.

Our investigations have demonstrated a definite relation between infection and macrophage response within chorionic villi, in which the clasmatocyte plays a most important part; and as Gay and Morrison indicate, successful resistance to bacteria is constantly associated with a high clasmatocyte count. Indeed, there is suggestive evidence that they may represent the bacterial macrophages *par excellence*, and that both active and passive local immunity may depend upon their mobilization.

In syphilitic infection, my observations have led me to conclude that the structural modifications in the villi represent the response of the reticulum cells to spirochetes, and from this it is not a long step to suggest that the placental tissue thereby acquires a certain degree of local resistance. The acquisition of such an increased resistance to treponemata would account for the fact that most of the investigators, (Bab, Graefenberg and others) have failed to detect spirocheta within the placenta; whereas they are present in the fetal organs to an extent never approached in the adult. That is to say the protective power of placental tissue is limited, and cannot prevent spirochetes from eventually entering the fetal blood stream and reaching the defenseless fetal tissues, which seem to offer a specially suitable medium for their multiplication.

In this connection, it must be remembered that the serum of the newborn child, as a rule, fails to exhibit a trypanocidal faculty, a

fact which has recently been substantiated by Rosenthal, who correlates it with the imperfect functioning of the fetal liver, which is the most important organ concerned in the production of such substances. Therefore, keeping in view, the resisting forces inherent in placental tissue, a plausible explanation might be adduced for the interesting clinical observation that syphilis on the part of the mother does not necessarily imply infection of the fetus, as is exemplified in some of the cases mentioned by Williams, in which syphilitic lesions or spirochetes could not be demonstrated in the fetal organs, despite the fact that the mother presented a positive Wassermann or that the placenta showed specific changes.

Again, there is another point, to which I should like to call special attention. As has been repeatedly stated, the histiocytes are a characteristic constituent of chorionic tissue during the first half of pregnancy, and under normal conditions disappear after that period. It seems justifiable to postulate that these cells play an important function in the metabolism of the fetus so long as certain of its organs, more particularly the liver, are insufficient for the requirements of the fetal household. We have no idea what the physiologic function of the elongated spindle-shaped cells is which in the mature placenta lie in the peripheral zones of the villi between the fetal capillaries and the syncytium; but according to Warren H. Lewis, they take up neutral red in the same manner as the specific reticulum cells. These structural peculiarities of the placenta may account for the fact that syphilitic infection of the fetus does not, as a rule, make its appearance until the latter months of pregnancy, as stated by Trinchese, Tissier, and Girauld, who hold that prior to the sixth month spirochetes are rarely present, but after that period they may be demonstrated in large numbers in the fetal organs. Moreover, my studies have revealed the interesting fact that frequently even at term, the presence of reticulum cells in the apparently normal placenta may indicate that syphilis had previously existed, but had been cured. Such observations are in keeping with the observation of Maximow that polyblasts return to their resting condition after the inflammatory process has subsided.

Furthermore, I might mention the further observation, that careful examination of the mature placenta in certain cases of acute tuberculous infection shows the presence of many reticulum cells. On the other hand, the routine study of four hundred consecutive normal placentae at term showed that reticulum cells were present in only 8 per cent of the number; and, upon carefully going over the histories of many of the respective patients, the existence of chronic inflammatory processes in the tonsils, the sinuses, or the mastoid could be elicited. Since we have become familiar with the fact that this peculiar change in the cells of the chorionic stroma represents a re-

sponse to infection, the next step will be to make a thorough search in such cases for concealed sources of chronic infection in various parts of the body and to evaluate their significance.

In conclusion, I do not know whether there is any connection between the visible response of the reticulum cells to syphilitic infection (implying a hypothetical, locally immunizing faculty) and the well-known clinical observation that in pregnant women the disease differs markedly from the usual type and responds much more favorably to treatment,—a phenomenon which has been established by Williams, Moore and Keidel, and Brown and Pierce, but for which no satisfactory explanation has thus far been adduced.

REFERENCES

Acconci: Fol. gynec., 1919, ix.
Bab: Ztschr. f. Geburtsh. u. Gynäk., 1907, lx.
Bieling: Ztschr. f. Immunitätsforsch. u. exper. Therap., 1922, xxxviii. Ztschr. f. d. ges. exper. med., 1923, xxxv.
Bumm: Grundriss zum Studium der Geburtshilfe, 1922, ed. 15.
Brown and Pierce: Am. Jour. Syph., 1920, iv, No. 4.
DeLee: Principles and Practice of Obstetrics, 1924, W. B. Saunders Company, Philadelphia, ed. 4.
Evans: Am. Jour. Physiol., 1915, xxxvii.
Evans, Bowman and Winternitz: Jour. Exper. Med., 1914.
Evans and Scott: Contrib. to Embryology, 1921, x.
Gräfenberg: Archiv. f. Gynaek., 1908, lxxxviii.
Gay and Morrison: Jour. Infect. Dis., 1923, xxxiii.
Goldmann: Neuere Untersuchungen über die äussere und innere Secretion im Licht der vitalen Faerbung, 1912.
Hitchmann and Volk: Wien. klin. Wchnschr., 1903.
Kiyono: Die vitale Karminspeicherung, 1914.
Lewis, W. H.: Johns Hopkins Hosp. Bull., June, 1924.
MacCallum: Pathology, ed. 3, 1924, W. B. Saunders Co., Philadelphia.
Mac Nee: Zieglers Beitr. z. path. Anat. u. z. allg. Path., 1914, lviii.
Maximow: Physiol. Review, 1924, iv, Jour. Infect. Dis., 1924, p. 549.
Meyer, W. A.: Studies on abortuses, Contrib. to Embryology, xii.
Moore and Keidel: Jour. Am. Med. Assn., 1921, lxxvii.
Ranvier and Cornil: Arch. d'anat. mier., 1899, xxxi.
Rosenthal: Klin. Wchnschr., 1924.
Sabin, F. R.: Bull. Johns Hopkins Hosp., September, 1923.
Seitz: v. Winckel, Handb. der Geburtsh., 1913; v. Doederlein, Handb. der Geburtsh., 1919.
Seidlin: Biol. Bull., 1922, xliii, No. 2.
Tissier and Girauld: Bull. Soc. d'obst. de Par., 1908, No. 1.
Trinchese: Beitr. z. Geburtsh. u. Gynäk., 1913, xviii.
Williams, J. W.: Obstetrics, ed. 5, 1924. Bull. Johns Hopkins Hosp., May, 1920; October, 1920; November, 1922.

A CASE OF SYMPUS DIPUS. AN ANATOMIC STUDY

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IN the domain of teratology the occurrence of double monsters and of monsters with multiple arms and legs is comparatively common. There is also a relatively rare but sharply defined class of monsters which is characterized most conspicuously by a fusion of the lower extremities, making up roughly 1 per cent of the whole group. Various picturesque and descriptive terms such as monopodia or monopedia, monomeri, sireniforma, sirenomelia, or siren-like have been applied to this form, but it was not until the time of Geoffroy St. Hilaire, in 1838, that an attempt was made to analyze this type. He classified these monsters into three groups according to the findings in the fused lower limbs, namely:

1. Symele,—in which the two lower extremities are almost perfectly united and terminate in a double foot, the sole of which is turned toward the front.

2. Uromele,—in which the two lower extremities are very incompletely united and terminate in a single foot, usually very incomplete, the sole of which is turned toward the front.

3. Sirenomele,—in which there is a very incomplete union of both lower extremities which terminate in a stump or in a point without a distinct foot.

In 1861, Foerster introduced a classification which was very similar to that of St. Hilaire. His terminology was more descriptive in character and is now more generally used in both English and German literature. The terms sympodia and symelia were applied to this whole group, while the symele of St. Hilaire was given the name sympus dipus, the uromele became the sympus monopus, and the sirenomele became known as the sympus apus. Of these the sympus apus is the most frequent, while the sympus dipus is most rarely seen.

A fairly complete search of the literature reveals only a small number of authentic cases of the sympodia and references prior to 1800, deal more with mythical and legendary reports than with actually verified occurrences.

Aristotle does not mention the sympodia, although he enumerates the various forms of monstrosities with which he was acquainted.

Pliny states in his Natural History on the authority of Ctesias, "that near the country of Troglodytes, there existed a race of men

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called Monocoli who were able to walk and jump with much agility although they possessed but one median lower limb. These Monocoli were also called Sciapodae because they were accustomed to recline on their backs during the heat of the sun and to protect themselves from its rays by their overspreading foot."

G. Moorhead thinks that this legend may be regarded as "being inspired by the occasional occurrence of symelian fetuses, especially in view of the tendency of writers in those days to look upon monstrosities as the chance occurrence among men of beings belonging to another race or type. As such, it may be regarded as the earliest reference to the sympodia."

In searching the available literature pertaining to the sympodia, the author limited himself to collecting reports of the sympus dipus, of which he was able to find but ten authentic cases. If more than one bone was missing from the legs and thighs, it was considered to belong to the sympus monopus or sympus apus group rather than to that of the sympus dipus.

Coleman in *American Medicine of Vermont and New York*, 1915, gives a short description of a sympodial monster which he considers to be a sympus dipus. A study of the roentgenogram of this monster, however, shows a well developed left femur, a few remnants of the head of the right femur, while in the leg region was seen but one tibia and no fibulae. In the foot were various irregularly placed tarsal and metatarsal bones. This specimen apparently belongs to the group designated as sympus monopus.

Singer, in *St. Louis Medical Review*, 1906, describes a case under the title "A case of Sympus (or Symmelus) Dipus" as follows: "The subject in my case was one of twins; the other, the first born, was a normally formed and healthy male child, is still living and has never been sick. The parents are both strong and healthy. It was a breech presentation and the cord was clear of the body, not wrapped around it in any way. The child lived for two hours, and cried lustily. It could move its arms and legs.

"There appeared to be only one bone (femur) in the upper part of the limb, but two fused bones in the lower part. The feet were distinct. Most, if not all, of the pelvis was recognizable. As to the external organs of generation, there was an opening, but I could not tell whether it was an anus or a vaginal opening. Neither feces nor urine was passed."

This specimen is to be considered as a sympus monopus.

The following cases of sympus dipus were collected and the reports abstracted.

Cruveilhier: *Anatomie pathologique du corps humain*, Paris, 1835. This was a full term female child with right-sided club hand.

Skeleton: A normal sacrum. The rami descendens ossis pubis et ossis ischia were fused with the corresponding bony elements of the opposite side. The symphysis pubis was closed. The ossa ischia were also fused, forming a bony shelf which separated the pelvis into anterior and posterior portions. A true pelvic cavity, therefore, did not exist. The ossa ilei were not fused, but spread out flat. The hip joints were in their normal places. The lower extremities rotated outward; the patellae were placed laterally, and the right one somewhat posteriorly. Of the bones of the extremities, only the calcanei were fused at their lateral borders. Both fibulae existed, lying between the tibiae. The muscles missing were

the semitendinosus, obturator externus and internus, quadratus lumborum, and the gemelli, except the superior, which was vestigial, as were also the pyriformis, the gluteal muscles, and the tensor fascia lata. All the other muscles of the lower extremities were present. The tibialis anticus, extensor digitorum communis, and the extensor hallucis longus were fused into one mass, out of which originated their respective tendons.

Intestinal tract: The ileocecal valve and the appendix were missing. The colon was enormously distended, ending blindly in the pelvis. The anus existed on the dorsal surface of the child. In the region of the anus there was a pedunculated round appendage consisting of skin and mucous membrane.

Urogenital system: The kidneys were found in the iliac fossae; the left kidney was cystic and the right very small. Both ureters opened into an enlargement which might be considered as a rudimentary bladder. The adrenals were normal in position. The external genitals were indicated only by a small papilla found on the anterior surface of the body. The ovaries and tubes existed on both sides, and on the left side a small uterine segment was attached to the blind sac of colon by a fibrous strand. No vagina was present.

Benington: *Journal of Anatomy and Physiology*, 1891.

Child was born at full term and appeared perfect above the pelvis. The lower limbs united from the pelvis down. The two feet were fused, with the soles turned anteriorly. There were nine toes in all, the second toe of the left foot being absent. The left big toe was at almost right angles to its normal position. The external genitourinary organs were entirely absent. No sign of an anus was found. The chest findings were normal. In the abdomen, the liver and spleen were normal. The suprarenal glands were large but of normal structure. The kidneys, ureters, and bladder were entirely wanting. The testicles were in the inguinal region. The gastrointestinal tract was normal until the cecum was reached. Above this point, the bowel was enlarged, filled with meconium, and at the sigmoid flexure ended in a blind cone. Only one umbilical artery was present. In the extremeties, the patellae were placed laterally and posteriorly. The tibiae and fibulae had a greater degree of rotation than the femora. The fibulae were near each other in the midline.

T. Manners-Smith: *Journal of Anatomy and Physiology*, 1895.

The thoracic and abdominal viscera had been removed from the specimen previous to his examination and no record had been kept of the findings.

The skeleton showed separate and well developed iliac bones; the ischia were fused; the pubes were normal. The lower ends of the fibulae, the calcanea and the cuboids, and the fourth and fifth metatarsals were all fused and situated in the midline of the lower extremity. All the muscles normally found above the knee were present, except the long head of the biceps, the semimembranosus, and the semitendinosus. The inferior gemelli were fused, forming a narrow strip, and crossing to opposite sides. The adductor magnus arose by a narrow tendon on either side of a triangular piece of bone representing the fused ischia. In the leg and foot no trace of the gastrocnemius, soleus, or peroneus tertius could be found. The flexor longus digitorum and flexor longus hallucis were fused.

Cichorius: *Archiv für Gynaekologie*, 1904.

The maternal history was essentially negative. The specimen weighed 2300 grams at birth and was 39 cm. long. The infant lived eight days, refusing all food after the first few days, and weighing 1600 grams at death. Urine, but no meconium, had been noticed on its clothing. Fusion of the legs was complete to the heels, the left foot, with its six toes, being rotated outward, while the right side was more deformed, the heel pointing to the front and the toes backward.

No external genitals were visible. On the back, in the region of the buttocks

there was a small indentation out of which arose a small tail-like structure. At the upper edge of this indentation there was a small opening, just large enough to admit a fine sound for a distance of 1½ cm.

The chest findings were essentially negative. The liver, gall bladder, pancreas, spleen, and suprarenals were normal. The stomach, small intestine, cecum, and appendix were normal. The ascending colon was S-shaped and the colon continued as the transverse and the descending colon down to the sigmoid flexure where a short strip of rectum was attached to it, which ended in a large blind sac just to the right of the midline. The ovaries and tubes were present on both sides, each tube arising from a separate oblong uterine horn. A small horseshoe kidney, with one ureter, was located in the small pelvis. A cavity, 1½ cm. deep, existed between the uterine horns and was probably a sinus urogenitalis, accounting for the passage of urine.

The skeleton system, studied by roentgenograms, showed a convex scoliosis to the right in the dorsal and to the left in the lumbar region. The sacrum appeared at the left of the midline, presenting an irregular form with indefinite markings. The bodies of the ischial bones were fused in the midline. In the leg, two femora, two tibiae, and the left fibula were made out. In the right foot one shadow only was visible, while in the left the shadows of the talus, calcaneus, and diaphyses of the metatarsals were clearly shown. No examination of the muscular system was made as the specimen was kept for the museum.

Bauereisen: *Münchener Medicinische Wochenschrift*, 1905.

The described malformation was one of twins, born at the sixth month of gestation. The legs were fused in the midline to the toes, with the flexor surfaces directed anteriorly and the extensor surfaces posteriorly. No external genitals were seen, and there was an atresia of the anus and rectum. The lower extremity had two femora, two tibiae, two fibulae, and all the tarsal bones and bones of the foot. The ischia of the pelvis were fused and the sacrum, except for its uppermost portion, was missing. There was no movement in the knee or hip joint. The rest of the skeletal system was normal. The chest findings were normal. In the abdomen, no kidneys or ureters were made out. Both suprarenal glands were present and normal. Both testicles were present, lying in the internal inguinal ring. The bladder existed in the form of a urethra, continuing into the urachus. The rectum was markedly distended and ended blindly at the base of the bladder

In the other twin, there was also an atresia of the anus and rectum. In the abdomen, the bowel ended blindly on the posterior wall of the bladder. The left kidney was absent; the right kidney was enlarged and showed cystic degeneration. Urethra and external genitals were present, the testicles being at the entrance of the internal inguinal ring.

Gladstone, R. J.: *British Medical Journal*, 1906.

The fetus was born at full term with the feet foremost. They were fused completely as imperfectly developed feet. The fetus measured 39 cm. in length. The penis was imperforate and the anus was absent. The colon terminated in the urinary bladder. The kidneys and ureters were absent; the suprarenals were present and normal. The testis and vas deferens were present on either side and situated in the inguinal canal. The abdominal aorta divided into a large artery which passed into the umbilical cord, and a vessel which ran down in front of the vertebral column where it branched into two external iliac arteries. The main umbilical artery gave off a small branch on its right side. The renal arteries were absent.

The posterior borders of the innominate bones were fused together from the posterior superior spines to the great sacrosciatic notches, which came together in such a way as to form an opening for the exit of the great sciatic nerves. The tuberosities of the ischium and also the ischial and pubic rami were joined. The

cavity of the pelvis was almost obliterated. There was no perineal region, and neither an anus nor urethra was found.

No mention was made of the bones of the lower extremity, although from a study of a diagram, included in the article, showing the various muscles of the extremity, it was assumed that the femora, tibiae, and also the fibulae were present.

Kuliga: *Monatschrift für Geburtshülfe u. Gynaekologie*, 1908.

The specimen was that of a full term female, born in macerated state and weighing 2440 grams. The placenta weighed 400 grams, was oval in shape, measuring 10 by 17 cm., and from 2.5 to 3 cm. thick. The cord was 27 cm. long and was attached eccentrically. Externally the fetus showed a small penis-like appendage in the region of the external genitals, consisting only of skin and mucous membrane. The anal and urethral openings, as well as raphé perinei were absent.

The chest findings were essentially normal. The left kidney was hypoplastic with its ureter and pelvis dilated. The right kidney with its ureter and also the urethra were absent. The rectum and appendix vermiformis were absent. The jejunum, ileum, colon ascendens, and the right part of the transverse colon possessed a common mesentery. The internal genitalia resembled the female type, developed on both sides but rudimentary in character. These ovaries were placed laterally on a large sac, which was clearly a cloaca, since the colon and left ureter emptied into it.

The umbilical artery was replaced by a persistent omphalomesenteric artery. The spermatic arteries originated from the suprarenal arteries. The right renal artery was absent.

The skeletal system showed a slight kyphoscoliosis with an irregularity in the form and number of both lumbar and sacral vertebrae, and a defect of the coccyx. The ossa ilei showed abnormalities of form, and position, as well as of union with the vertebral column. The ossa ischia and rami descendens ossis pubis were in contact and joined by connective tissue.

The brain substance was quite soft, but showed no evident deviation from the normal so far as could be determined.

Sacchi, Antonio: *Folia gynaecologica*, 1910.

The fetus was about three months premature, weighing 950 grams and measuring 36 cm. in length. The upper portion of the body was normal and well formed. The legs were fused in the midline. Two vessels, an artery and a vein, were present in the umbilical cord. No sign was found of any external genitals or an urogenital sulcus. The chest findings were normal. The liver, spleen, pancreas, and suprarenal glands were normal histologically. The gastrointestinal tract ended in the region of the descending colon as a double sac, occupying almost the entire pelvic cavity. No trace of any kidneys, ureters, or bladder was found. The testicles, with their epididymes were found on either side and were normal in microscopic structure. The ossa ischia were fused in the midline; the sacrum and coccyx were small and of indistinct cartilaginous structure.

Two femora, two tibiae, and a small strip of cartilage placed on the inner side of the left tibia were found in the extremities. Ten toes were present, six being on the right and four on the left side.

The abdominal aorta gave off a celiac axis, a superior mesenteric artery, a right iliac artery, and ended by dividing into a large umbilical artery and the left femoral artery. The right iliac artery, in turn, gave off three pairs of lumbar arteries and divided into a right femoral artery and the hypogastric artery.

Awidon, H.: *Inaugural Dissertation*. Zurich, 1919.

The infant was born two months prematurely. The entire abdominal organs were prolapsed. The legs were completely fused and so curved that the double foot almost touched the back of the neck. The length from the small fontanel to the

toes was 27.5 cm. The upper portion of the body was quite symmetrical. The anterior abdominal wall was missing. The thigh measured 5 cm., and the leg with the foot, 7.5 cm. Four toes were present, two for each foot. The nails were not developed. No external genitals or anus were demonstrable.

In the roentgenogram a marked kyphoscoliosis was present in the thoraic region. Twenty-four ribs were present. The pelvic bones were not visible in the picture. The two femora were fused. Two tibiae and one fibula were present. Several bony structures were seen in the foot.

A cystic left kidney with its ureter was found. An inverted bladder, only the posterior wall of which could be made out, was found on the right side beneath the small intestine. Two minute openings of the ureters of either side were distinguished. The intestinal canal ended in a blind sac in the region of the cecum and also communicated with the bladder remnant on the right and left sides. Above the cecum, enveloped in a broad ligament, were found the right ovary, tube, and a uterus unicornis. The left internal genital organs were not found.

Langer, E.: *Zeitschrift für Geburtshülfe und Gynäkologie*, 1922.

This specimen was born shortly before the outbreak of the war, in 1914, and was not examined until about five years later.

It was a full term child, showing no external genitalia. Dorsally, an opening permitting the entrance of a very fine sound was present. The legs were completely fused. Nine toes were present, with the large toes on the outside. The head, neck and upper extremities were essentially negative. Externally, the chest and abdomen showed nothing unusual. The umbilical cord showed but one artery and one vein. The thymus was very large, pushing the heart over to the right, filling the entire anterior mediastinum and reaching to the diaphragm below. The collapsed lungs rested on the vertebral column. In the abdominal cavity, the liver, spleen, and pancreas were normal. The gastrointestinal tract was normal until the descending colon was reached, where the colon was dilated and filled with meconium. The two adrenals were normal throughout. Two testicles, showing normal microscopic structure, were found in the pelvis. Two cyst-like structures were lying directly beneath the testicles; microscopic examination of the walls showed kidney structure. Each cystic kidney had its ureter which united with the ureter from the opposite side just before entering the rudimentary bladder.

The abdominal aorta divided into a large umbilical artery and a smal'er vessel, which was considered to be the arteria iliaca sinistra. Given off from the umbilical artery were two vessels which Langer thought to be the arteria hypogastrica dextra and arteria iliaca dextra externa.

The muscles of the lower extremity could not be studied, as the fixing fluid in which the specimen was immersed for several years had almost completely hardened the structures.

The skeletal system was studied from a roentgenogram, which revealed a normal sacrum and iliac bones which were normal in form but somewhat flattened. The corpora ossis ischia were fused in the midline, while the rami horizontal ossis pubis lay laterally to the fused ossa ischia. The lower extremity showed two femora, two tibiae, with two fibulae lying between them. In the ankle, there was a bony structure which probably represented the two calcanea. In the foot, the bones of nine toes were present, the large toes on the outside, while the central one was probably a rather thick small toe.

The specimen herewith described was born in 1923, occurring in the private practice of F. L. Adair.

The mother was twenty-eight years of age, a primipara, whose family and past history were entirely negative. Her last menstrual period occurred on January 23,

1923, although one month later she had a slight dark bloody discharge; no other untoward signs or symptoms were manifested. No spotting or bloody discharge occurred after that. Quickening occurred in July, 1923. The urine was normal at all times and the systolic blood pressure ranged from 106 to 126, while the diastolic ranged from 60 to 74. The pelvic measurements were as follows:

Interspinous	27.0 cm.
Intercristal	30.5 cm.
Intertrochanteric	33.0 cm.
Baudelocque	21.5 cm.

October 8, 1923, examination revealed the "breech" to be low in the inlet, head in the left upper quadrant, and back to left. Pains began at 5:00 A.M. and continued until 3:00 P.M., ten hours later, when the fetal heart tones became quite irregular and weak. The membranes had already ruptured and the dilation was complete. The perineum was then well ironed out. A finger was placed in the child's groin and after slight traction the body was readily delivered, using the Smellie-Veit method in the delivery of the head. The amount of amniotic fluid was not unusual. The placenta was inverted on delivery, which was by simple expression, measured 16 by 11 cm., and was complete, as were also the membranes, which had a marginal tear. The cord was 50 cm. in length, was attached laterally, and contained only two vessels, one artery, and one vein. After delivery, the heart continued to beat for from five to ten minutes, although no respirations were established. The skin was quite pink, turgor good, and lanugo was quite abundant on the shoulders and back. The nails were fully developed and reached the tips of the fingers and toes. Eyebrows were present, as was also a considerable amount of reddish brown hair on the head.

The head, trunk, and upper extremities had the appearance of a well-developed child except that the index and middle fingers of each hand were flexed, while the fourth and fifth were extended. The umbilical cord was normally placed and possessed considerable Wharton's jelly. The lower limbs were completely fused as far down as the toes and formed an obtuse angle of about 160° with the trunk. The markings about the hip-joints were not clear, while in the region of the knee joint the patellae were directed laterally and posteriorly, indicating an outward rotation of the limbs. The heels, which were fused, were directed anteriorly, as was the plantar surface of the fused feet, and the large toes were located laterally. The entire lower limb was deviated slightly to the left of the midline and in its middle portion a rather shallow furrow could be made out, giving the impression that the union of the two limbs was one of soft parts only. The femora and the tibiae could easily be palpated on either side. Nine rather closely approximated toes were present, four for each foot, while the central toe appeared to be common to both sides, lying more dorsal than the others, and extended so as to form an angle of about 45° with the dorsal side of the foot.

No sign of any external genitals could be seen, although in this region a narrow transverse groove was present in the skin.

On the dorsal surface of the body a slight scoliosis to the right was present in the thoracic region and to the left in the lumbar and sacral regions. Several loose transverse folds of skin were present in the lumbar, sacral, and gluteal regions. No anal opening could be seen, although at the lower end of the vertebral column was a small indentation where the skin was closely adherent to the coccyx. No longitudinal ridge or raphé was present.

Pictures and roentgenograms of the body are shown in Figs. 1 to 5.

The body was embalmed with 200 c.c. of a solution composed of formalin (10

per cent), carbolic acid (5 per cent), and chromic acid (1 per cent), after which it was kept for several days in a solution of 5 per cent formalin.

Before dissecting and reconstructing the specimen, it was fixed firmly in a tray of hard paraffin. The outlines of the body, of the abdominal and thoracic viscera, and of the muscular and skeletal systems were then determined according

Fig. 1.

Fig. 2.

Fig. 1.—Front view showing the absence of external genitalia, the fusion of the lower limbs to the toes with the heels and soles placed anteriorly. The large toe is seen on the outside with the three toes and a fourth wedged in. The extension of fourth and fifth fingers and flexion of the first and second is also shown.

Fig. 2.—Rear view. The well-developed nails are clearly seen on the first and second fingers. The scoliosis in the thoracic region to the left and to the right in the lumbar region, the small indentation in the skin at the end of the spine where the skin is closely adherent to the coccyx, and the dorsal surface of the foot with the nine toes are all clearly shown.

to the method described by R. E. Scammon in the *Anatomical Record* of April, 1921. These determinations were recorded on coordinate paper, additions being made as the various parts were exposed, thus showing accurately the relationship

of the various parts to each other. The reconstructions made are shown in Figs. 6 to 12.

On opening the thoracic cavity, the findings were not unusual. The thymus was not enlarged and it presented no deviations from the normal, either grossly or microscopically. The heart did appear to be a trifle enlarged and covered the lungs almost entirely when viewed from the front. Its structure was normal. The lungs seemed to be somewhat smaller than the average, but not unusually so.

Fig. 3.—A roentgenogram of the monster from the front. Normal relations are found in the head and upper extremities. Shadows of the fourteen ribs and fourteen thoracic vertebrae are clearly shown. In the pelvis the right side is seen to be higher than the left, the iliac bones are separate and fairly normal in form; the horizontal rami of the pubes lateral to the fused ischia and the ascending ramus of the pubes are seen.

The diaphragm of the right came up to the level of the fifth rib, and to the level of the fifth interspace on the left. Neither the pleural nor pericardial cavities showed much fluid. On opening the abdominal cavity, the liver, as in all newborn infants, was relatively enlarged, with a gall bladder normally located and of normal size. The umbilical vein followed the normal course and entered the liver at the umbilical fissure, as shown in Fig. 6. A normal spleen was present, its superior

margin on a level with what was the thirteenth thoracic intervertebral disc. The inner edge of the spleen was from 0.5 to 1.0 cm. from the vertebral column. The microscopic structure was normal. A normal pancreas was found lying beneath, and quite firmly attached to the stomach and duodenum and crossing the twelfth, thirteenth, and fourteenth thoracic vertebrae. The head, body, and tail of the pancreas were quite readily determined.

Of the abdominal organs, the most striking changes occurred in the lower portion of the intestinal tract. The esophagus opened into the stomach at the level and a little to the right of the ninth thoracic vertebra. The stomach was

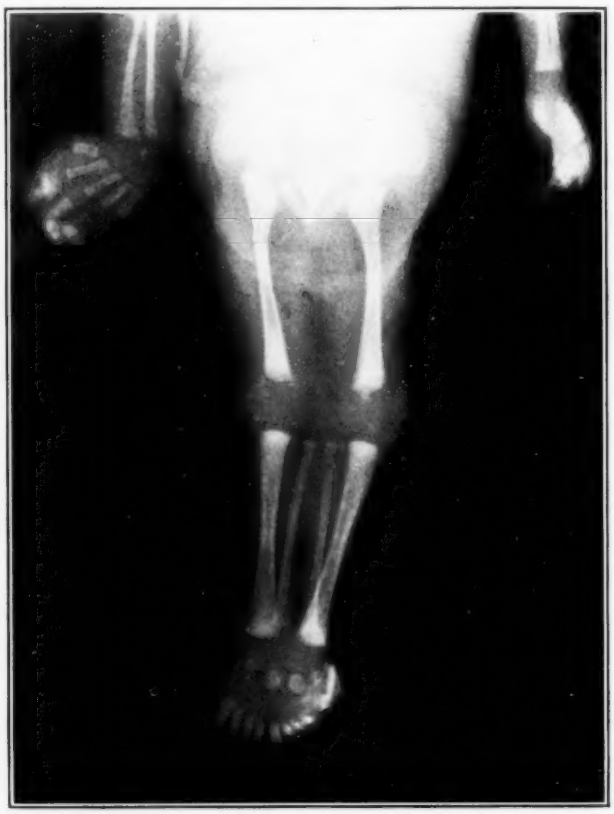

Fig. 4.—A roentgenogram of the lower extremity with the two femora, two tibiae with the two fibulae lying between, the four ossification centers in the tarsus, the nine metatarsals, and the faint shadows of the phalanges.

normal in size and structure, opening into the duodenum at the level of what was the thirteenth thoracic intervertebral disc. The jejunum and ileum were located entirely to the left of the vertebral column, except in the terminal portion, where the ileum crossed the vertebral column at the level of the fourth and fifth lumber vertebrae. It emptied into the cecum just to the right of the fifth lumbar vertebra. A normal appendix was found just to the right of the ileocecal junction, and it pursued an upward direction. The cecum was markedly distended with meconium, coursing to the left for a distance of about 6 cm., when the lumen of the bowel quite suddenly became narrower and assumed the appearance of a normal colon. This portion was covered by the small intestine, crossed over to the right,

and just beneath the margin of the liver on the extreme right, its lumen again suddenly enlarged, curved sharply to the left to end in a blind pouch, tightly filled with meconium. No communications or connections could be determined with any of the surrounding structures. Lying in the pelvis were two small oval-shaped

Fig. 5.—A roentgenogram from the side showing clearly the spinus processes and the separate bones of the sacrum and their backward direction.

structures which, on microscopic examination, proved to be normal testes with well-developed epididymes. The testicle on the right was found lying in the iliac fossa, enveloped by a fold of peritoneum, which continued downward to enter the inguinal canal for a distance of about 1 cm., forming a peritoneal sac, the processus vaginatis peritonaei. The left testicle was slightly larger and was found lying just to the

right of the vertebral column in the small posterior cavity of the pelvis. The fold of peritoneum which covered it was longer and more redundant than that on the right and continued downward and to the left, to enter the left inguinal ring where a blind sac, similar to the one on the right, was found.

After having determined the various structures enumerated above, the umbilical artery was traced to the abdominal aorta. In the anterior abdominal wall it was

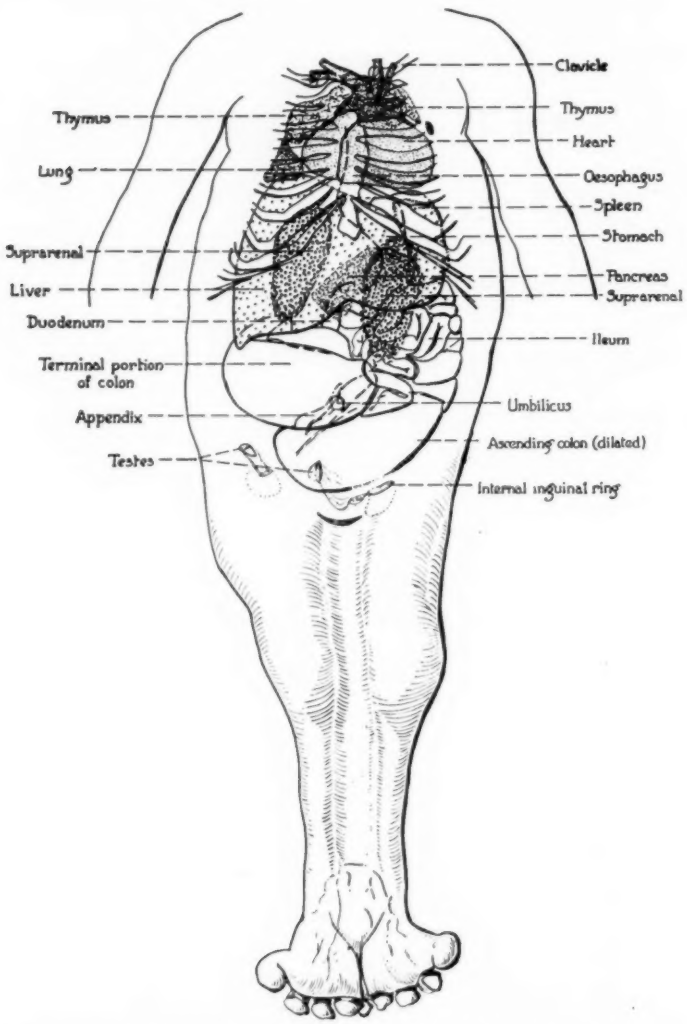

Fig. 6.—A reconstruction of the internal organs and their relationship to each other and to the external markings.

covered by peritoneum; it then passed downward and backward beneath the distended colon to its origin from the abdominal aorta at the level of the first lumbar vertebra. On following the course of the abdominal aorta, several vessels, aside from the umbilical artery, were given off, namely the superior mesenteric artery, the celiac axis, the inferior mesenteric artery, and three pairs of lumbar arteries. Between the first and second sacral vertebrae, the aorta divided into two branches, the left one immediately sinking into the deeper portion of the lower extremity,

very much like an internal iliac artery, while the right branch pursued a more superficial route similar to an external iliac artery.

The parietal peritoneum was then carefully stripped from the entire dorsal surface, thus exposing two flat bodies, irregularly oval shaped, which on microscopic examination showed normal suprarenal gland structure. On the right side, the gland was so placed that its medial border approximated the right side of the vertebral column, its superior margin reaching almost to the level of the ninth thoracic vertebra, while its inferior margin was at the level of the first lumbar vertebra. The gland on the left was placed somewhat lower than the one on the right, its superior margin being at the level of the eleventh thoracic vertebra, and its inferior margin being at the level of the third lumbar vertebra. No trace of any kidney substance could be found, nor were any vestiges of a ureter or urinary bladder discovered.

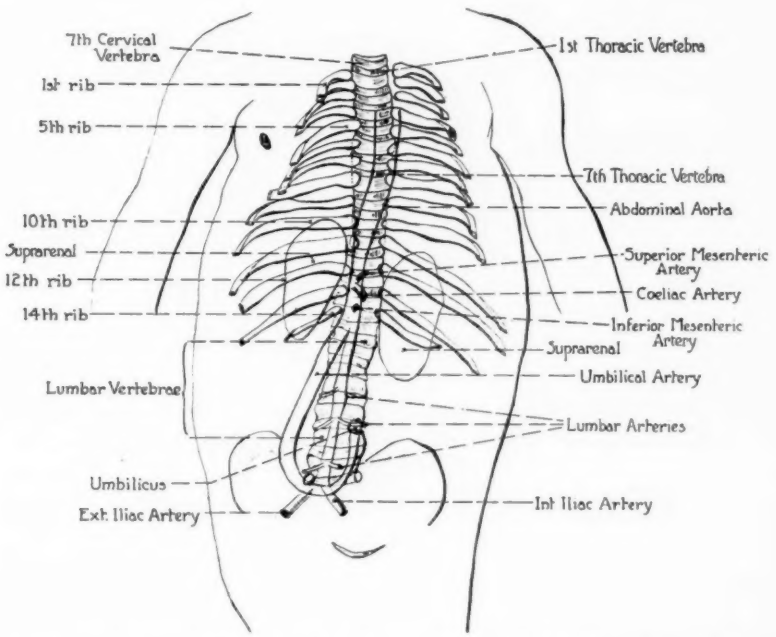

Fig. 7.—A reconstruction of the ribs and vertebral column showing also the position of the suprarenals and the abdominal aorta with its branches.

In examining the skeletal system, special attention was given to the ribs, vertebrae, pelvis, and bones of the fused lower extremities. Fourteen ribs were found on either side, each one articulating dorsally with its own vertebra. The first twelve had bony shafts which extended, as a rule, to the axillary line, while the thirteenth and fourteenth were almost entirely cartilaginous. Anteriorly, the costal cartilages of the first eight ribs on the right side and the first seven on the left were fused with the sternum. At the junction of the xiphoid process and the body of the sternum, a niche was formed into which the tip of the ninth rib on the right and the eighth rib on the left fitted nicely. The five lumbar vertebrae were normal. The sacrum was represented by five closely knit vertebrae, although easily distingiushable from each other, and with the coccyx was directed almost straight backwards between the iliac bones. The sacrum articulated laterally with the iliac bones, and when the lower limb was flexed on the abdomen the movement oc-

curred at these joints rather than at the acetabula. The coccyx was entirely cartilaginous and the vertebrae were represented by four small cartilaginous nodules.

The pelvis presented several very marked and interesting changes. The iliac bones appeared to have a fairly normal form and size. However, the iliac crests were very slightly curved and the fossae were expanded and directed more forward than inward. On the medial surface of each ilium was a smooth joint surface where the two ilia articulated with the sacrum.

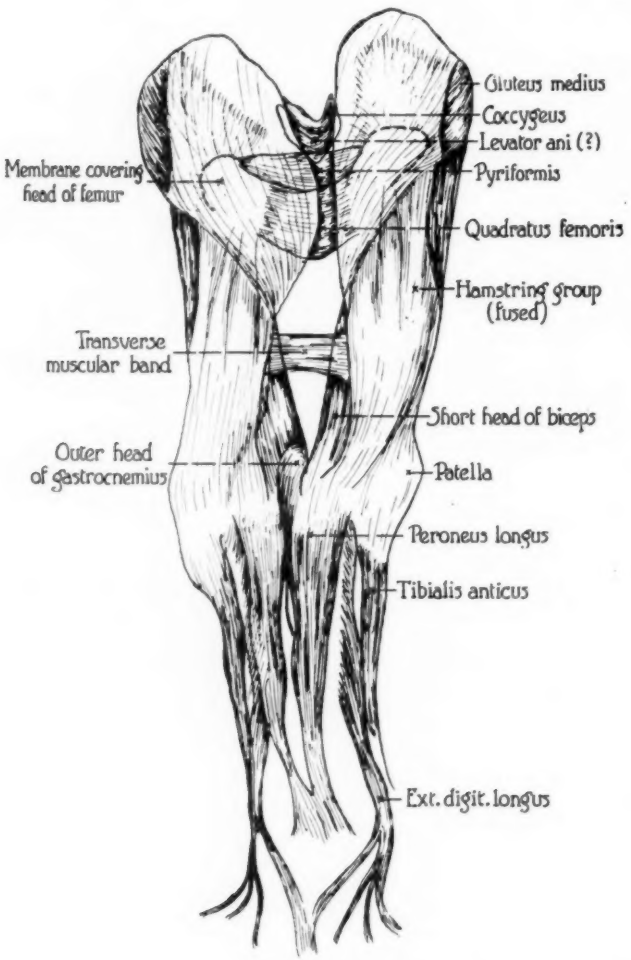

Fig. 8-A.—Showing the relationship of the muscles to each other. Reconstruction of the outer layer of muscles on the anterior side of the leg.

The tubera ischii and the ischial spines were fused in the midline so that a bar of cartilage divided the pelvic cavity into an anterior and a posterior part; the former was limited in front by the pubes and the latter bounded behind by the front of the sacrum. The two acetabular surfaces looked almost directly backwards and, owing to the fusion of the ischia, were drawn very near to the midline. Each joint was surrounded by a distinct capsule and both surfaces were considerably flattened. The two descending rami of the pubes were also fused and the horizontal rami were placed laterally to the fused ischia.

All the bones of the lower extremities were present and separate except the calcanea, the lateral borders of which were fused in the midline, and the fifth metatarsals with their digits, which were also fused in the midline. The two trochanters and the head of each femur were almost entirely cartilaginous, which, with the short neck that was present, formed almost a straight line with the shaft. The femoral head and neck of the left side were broader and thicker than those of the right. The shaft was nearly cylindrical, slightly arched convexly, and slightly twisted so that at the lower end, the intercondylar notch looked almost

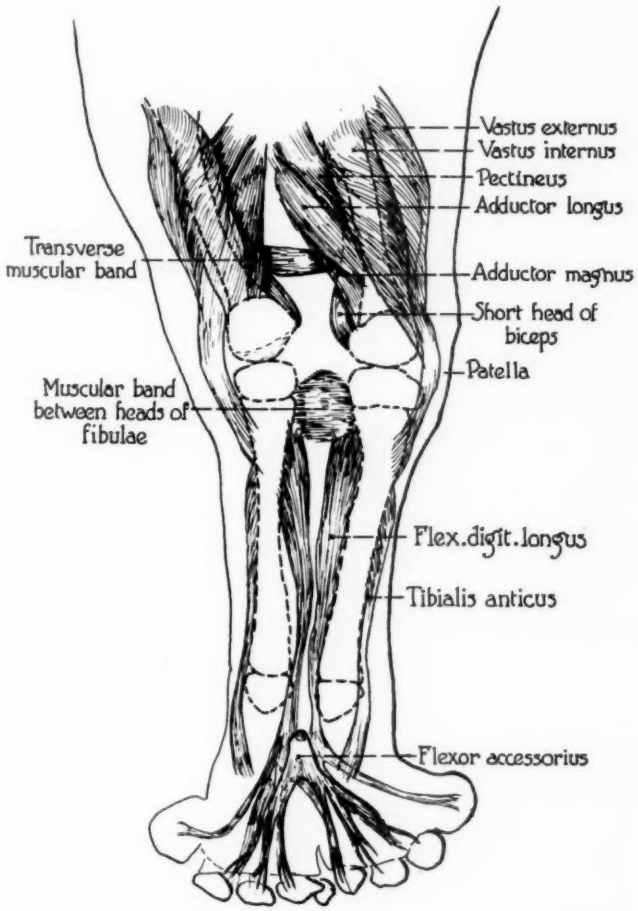

Fig. 8-*B*.—Showing deeper layer of muscles as seen from the anterior side.

directly inward. The internal tuberosity, with its condyle, was in front, while the external tuberosity, with its condyle, was in back. This rotation placed the trochlear surface on the outside where it articulated with the patella. The movement of the knee joint was very limited.

In the leg the tibiae were located on the outside, while the fibulae were placed between them. The upper end of each tibia was quite thick and inclined slightly forward and inward. The inner tuberosity had rotated to the outside, and the outer tuberosity with its articular facet for the head of the fibula was located behind and on the inside. The shaft of each tibia was quite thick and at its lower

end was quite large transversely. Placed on the outside was the internal malleolus, while on the inside were the ligamentous attachments between the tibia and fibula.

The two fibulae were located between the tibiae, separate, and on a plane posterior to that of the tibiae. An interosseous membrane was stretched between the tibia and fibula on either side, while between the two fibulae was found a similar membrane. Articulating below with the tibia and fibula on either side were the astragali on the outside with the bone representing the fused calcanea lying be-

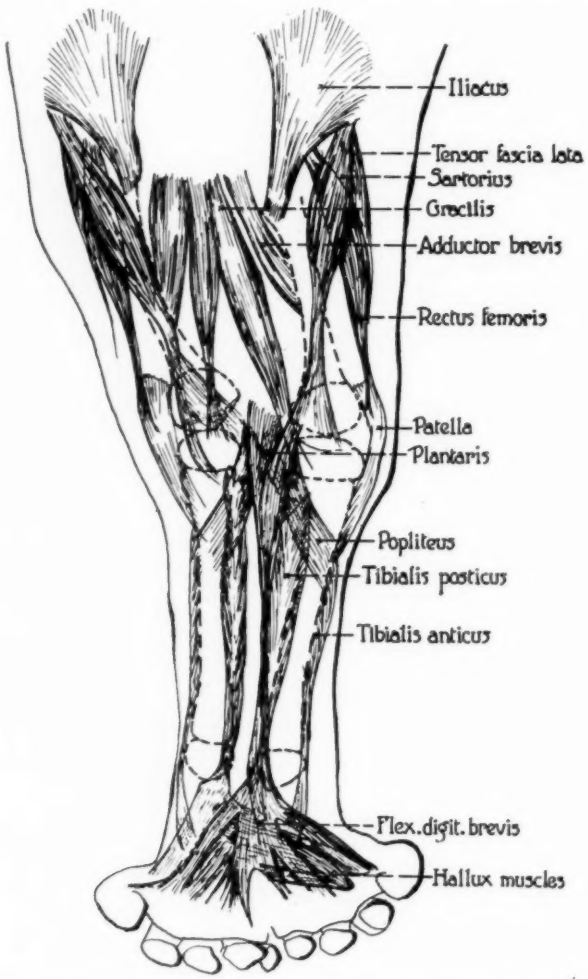

Fig. 8-*C*.—Reconstruction of the muscles as seen from the posterior side.

tween them. Below the astragalus on either side was located the navicularis which in turn articulated below with the three cuneiformes, the internal, middle, and external. Placed below the fused calcanea and between the two external cuneiforms were found the two cuboids, approximating each other in the midline. Articulating below with the tarsal bones were nine metatarsals, the first metatarsals being located on the outside, while the fifth metatarsals were in the midline fused with each other. Each of the metatarsals had its three phalanges.

In examining the muscles of the inferior extremity considerable difficulty was

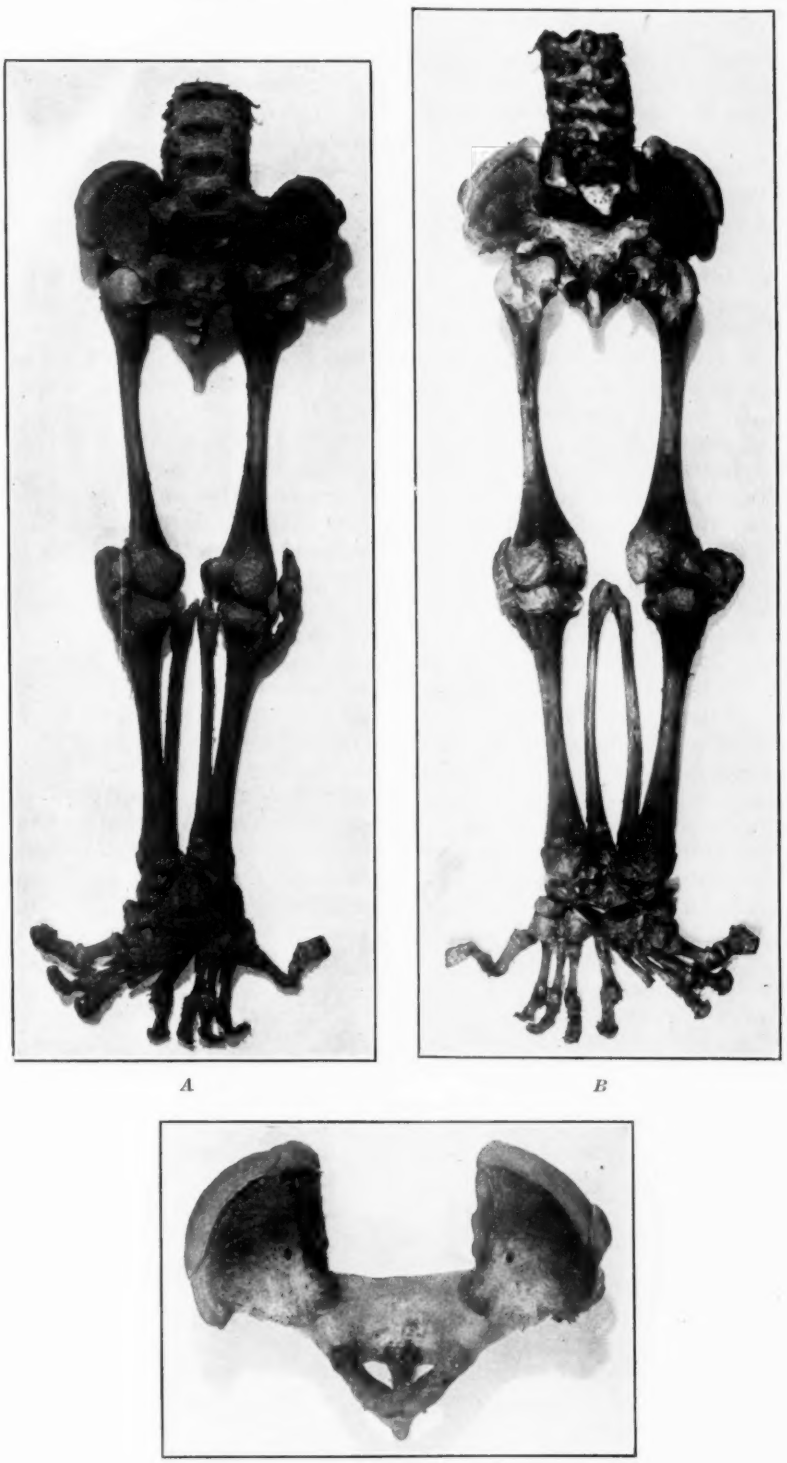

Fig. 9.—*A*, Photograph of the bones of the pelvis and lower extremity as seen from the front. *B*, Bones of the lower extremity as seen from the back. *C*, Photograph of the pelvis from the front.

experienced at times in determining the names to apply to them. This was especially true below the knee where the rotation of the limb was such as to bring the flexor surfaces to the front and the extensors to the back. The flexors of the thigh, the psoas magnus, and the iliacus had normal origins and insertions. The extensor muscle of the thigh, the gluteus maximus, was also normal in origin and insertion. Of the abductors of the thigh, the tensor fascia lata and the gluteus media had normal origins, while the gluteus minimus was found to originate mostly within the pelvis, fusing on its exit with the gluteus medius to insert on the upper portion of the fascial membrane covering the head of the femur ventrally. All five adductors of the thigh were present, being very intimately connected at their origins with the respective muscles of the opposite side. The adductors magnus, longus, brevis, and gracilis arose from the side of the fused ischia and descending rami of the pubes to pass downward and insert normally, the adductor magnus sending a few fibers to the head of the tibia, while the insertion of the gracilis on the left was covered by the insertion of the sartorius. The pectineus muscle had a normal origin and insertion. Of the external rotators of the thigh, only the obturator externus, the quadratus femoris, and the pyriformis were present. No trace of the obturator internus or of the gemelli could be determined. The quadratus femoris was present as a transverse muscular band stretching between the quadrate tubercles of the femora. The pyriformis also existed as a fused muscular strip extending between the great trochanters of the two sides; its course being just anterior to the coccyx and the poorly developed coccygeus muscle. Of the muscles flexing the leg, the sartorius had a normal origin on both sides, the insertion on the right, however, covering the insertion of the gracilis, while on the left its insertion was covered by that of the gracilis. The biceps femoris muscle originated by the short head only, inserting into the head of the fibula and the outer tuberosity of the tibia. The semimembranosus and semitendinosus were fused, originating from the lower portion of the tense fascial membrane covering the head of the femur ventrally. The insertion was into the fascia covering the popliteus muscle, the posterior ligaments of the knee and the inner surface of the tibia. The popliteus muscles had the usual origins, passing toward the midline where they were closely united, and then passed deeply to insert upon the external condyle of the tibia.

The extensor muscle of the leg, the quadriceps extensor femoris, was present, and each of its four heads had a comparatively normal origin. The direction was downward and lateral, its tendon enclosing the patella on the lateral side of the knee joint and inserting as the ligamentum patellae on the tubercle of the tibia.

Of the muscles moving the foot, the tibialis anticus was the only flexor present. It had its origin by two heads, the median coming from the head of the tibia, while the outer one was almost continuous with the insertion of the ligamentum patellae. At the ankle each tendon inserted upon the internal cuneiform and the first metatarsal which were placed on the outside margin of the fused feet. The peroneus tertius could not be determined.

Of the extensors of the foot, no trace of the soleus muscle was found. Arising from the inner surfaces of the two tibiae was a small bellied muscle which coursed backward between the short heads of the biceps femoris. It continued downward between and superficial to the peroneus longi to blend gradually with the fascia covering the muscles of the leg. This muscle was considered to be the outer head of the gastrocnemius. The tibialis posticus arose from the upper portions of the tibia and fibula and the membrane between. As the two muscles passed downward they were rather closely united in the midline. Each muscle ended in a rather broad tendon which united with that of the other just above the fused calcanea and divided to send tendons to the several bones of the ankle, and also gave rise to the origin of two small muscles which inserted on the first phalanx

of the large toe. These were probably the adductor transversus hallucis and the adductor obliquus hallucis. What was considered the plantaris muscle arose from the external condyle of the femur. It was a short bellied muscle approaching the midline to meet its fellow and continuing downward as a small tendon. At about the middle third of the leg the two tendons united and the common tendon continued downward to the region of the fused calcanea where a broad muscular band originated. From this thin flat muscular ribbon, strips were sent to each of the toes to insert into the second phalanges of each. This muscular continuation was considered to be the flexor brevis digitorum, while the small slip sent to each toe was probably the flexor brevis hallucis.

The peroneus longus arose by two heads, one on either side of the insertion of the short head of the biceps. Each muscle passed downward to the foot where their tendons united. A tendinous strip was immediately given off to the fourth and third metatarsals, while in the midline a flat tendinous band covered the dorsal surface of the fused fifth metatarsals.

The peroneus brevis was rather closely connected with the peroneus longus, originating from almost the entire length of the fibula. At the base of the fused fifth metatarsals the tendons were united and inserted and sent to either side a thin tendinous slip which continued down to the first phalanx of the fused small toes. Fusion occurred in the muscles governing the movements of the toes more frequently than in any other muscles of the extremity. The flexor longus digitorum and the flexor longus hallucis were fused and arose from the head of the tibia, and medially from the head and upper portion of the fibula. The combined muscle passed downward to the ankle where a rather long thin tendon was given off to the large toe and three separate tendons were sent to the second, third, and fourth toes, each passing to the last phalanx after perforating the tendons of the flexor accessorius. What was considered to be the flexor accessorius arose from the fused calcanea, united with its fellow, to pass between the tendons common to the flexor longus digitorum and the flexor longus hallucis. The tendon divided into two rather broad bands, each of which again divided into three, to pass to the second, third, and fourth toes. Each tendon was perforated by the tendon of the flexor longus digitorum opposite the first phalanx. The flexor brevis minimi digiti and the lumbricales were not definitely identified. All three extensors of the digits were made out.

The extensor longus digitorum arose from the head and upper part of the fibula and from the head of the tibia, passing downward through the annular ligament to divide into four tendons, each of which passed to the base of the second phalanx of the second, third, fourth, and the fused fifth metatarsals.

The extensor brevis digitorum arose from the upper and outer portions of the fused calcanea, each muscle dividing into four very thin tendons, one slip going to the first phalanx of the large toe and the others passing to the second, third, and fourth toes, closely associated with the long extensor tendons.

The extensor hallucis longus had its origin from the middle portion of the fibula, passing downward through the annular ligament, then outward to insert into the base of the last phalanx of the large toe.

No muscles which could be identified as abductors of the digits were found. Of the adductors of the digits, the adductor obliquus hallucis and the adductor transversus hallucis already have been mentioned under the tibialis posticus. No interossei muscles could be found.

In the lower extremity there were two transverse muscle bands, the nature of which could not be determined. The first band was stretched between the fasciae of the two sides at about the middle third of the thigh. Another muscle was found extending across and covering the upper and ventral surfaces of the two fibulae.

The brain and spinal cord were examined by J. C. McKinley, of the Department of Neurology, at the University of Minnesota. No definite pathology of the gross specimen could be determined. Both lobes of the hypophysis also appeared to be normal.

Various theories have been advanced to account for the occurrence of these monsters, some of them exceedingly clever explanations, especially that of Bolk. None, however, have been "able to meet all the demands which must be put to them. To be explained, and naturally by a minimal number of causes, are the above noted visceral defects and malformations, the defects and fusions in the limbs and pelvis, and probably also the presence of a single artery in the cord, an omphalomesenteric artery.

"It has been necessary to speak of fusion of the various parts for the reason that we are dealing with them in a fully developed condition. But we would again insist that actual union of even partially developed structures does not occur. What we describe at the end of development as a fusion is already determined at its very beginning by a nonseparation. We are obliged to speak in terms of end-results because of our ignorance of their mode of development." (Ingalls.)

In summarizing these cases of the sympus dipus as a whole, the following characteristics may be noted:

1. The fusion of lower extremities by their lateral borders.
2. The forward direction of the flexor surface of the leg as well as of the heel and sole of the foot.
3. The presence of only two vessels in the umbilical cord, one vein and one artery, an omphalomesenteric artery.
4. The loose attachment between the sacrum and the ilia.
5. The fusion of the ossa ischia and descending rami of the pubes thus obliterating a true pelvic cavity.
6. A scoliosis in dorsal and lumbar regions.
7. The almost constant presence of two femora, two tibiae with two fibulae between them and the patellae located laterally.
8. The interruption of the gastrointestinal tract in the region of the cecum to end in a blind sac.
9. The nondevelopment of the external genitals.
10. Atresia ani and recti.
11. The rudimentary condition of the kidneys, ureters, and bladder when present.
12. The presence of testes or ovaries, but in atypical locations.
13. The frequent absence of the small external rotator muscles in the thigh.
14. The absence or rudimentary condition of the calf muscles.
15. The fusion of flexor longus digitorum with flexor longus hallucis.

16. The fusion in almost all cases of like parts which are in a fully developed condition.

I am indebted to R. E. Scammon and F. L. Adair for advice and assistance in carrying on and completing this investigation.

REFERENCES

[1]Aristotle: On the Generation of Animals, Book VII, cap. II.
[2]Awidon, H.: Ueber die Sirenbildungen mit Beschreibung eines selbst beobachteten Falles von Sympus dipus. Inaugural Dissertation, Zürich, 1919, p. 25.
[3]Bauereisen, A.: München. med. Wchnschr., 1905, lii, 721.
[4]Benington, R. C.: Jour. Anat. and Physiol., 1890-1891, xxv, 202-209.
[5]Cichorius: Arch. f. Gynäk., 1904, lxxii, 571-578.
[6]Coleman, W. H.: Am. Med., Burlington, Vt. and N. Y., 1915, x, 761-771.
[7]Cruveilhier, J.: Anatomie pathologique du corps humain, Paris, 1835-1842.
[8]Foerster, A.: Die Missbildungen des Menschen, Jena, 1861.
[9]Geoffroy St. Hilaire: Histoires des Anomalies, 1836, ii, 239.
[10]Gladstone, R. J.: Brit. Med. Jour., 1906, ii, 1704.
[11]Hirst, B. C., and Piersol, G. A.: Human Monstrosities, Philadelphia, Lea Bros. and Co., 1892, pp. 89-112.
[12]Ingalls, N. Wm.: Cleveland Med. Jour., 1914, xiii, 677-693.
[13]Kuliga, Paul: Monatschr. f. Geburtsh. u. Gynäk., 1908, xxvii, 297-320 and 468-491.
[14]Langer, E.: Ztschr. f. Geburtsh. u. Gynäk., 1922, lxxxiv, 131-158.
[15]Manners-Smith, T.: Jour. Anat. and Physiol., 1895-96, xxx, 169-184.
[16]Moorhead, G.: Jour. Anat. and Physiol., xxxix, 450.
[17]Pliny: Natural History. Book IV, cap. III.
[18]Sacchi, Antonio: Folia gynaec., Pavia, 1910, iv, 539-561.
[19]Scammon, R. E.: Anat. Rec., April, 1921, xxi, 19-24.
[20]Singer, L. U.: St. Louis Med. Rev., 1906, liv, 405.

THE KIELLAND OBSTETRICAL FORCEPS AND ITS APPLICATION*

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VERY little has been written about the Kielland forceps in American medical literature. Only a few standard textbooks on obstetrics make even passing mention of the new forceps in their latest editions. Greenhill, however, in the American Journal of Obstetrics and Gynecology (1924, vii, 349), gave an extensive review of the foreign literature on the subject. I am impressed with the usefulness of the Kielland forceps and am convinced of its superiority over the classical forceps, in cases where the head is situated high in the birth canal, and where the head is deeply located in the pelvis with the sagittal suture in the transverse or oblique diameters.

The objections to the pelvic curve of the forceps were recognized among others, by Christian Kielland of Christiania, Norway. He devised an instrument which has a very slight pelvic curve and in

*Read before the Clinical Society of the Beth David Hospital, October 30, 1924, and the Alumni Society of the Sydenham Postgraduate Course and Hospital, January 14, 1925.

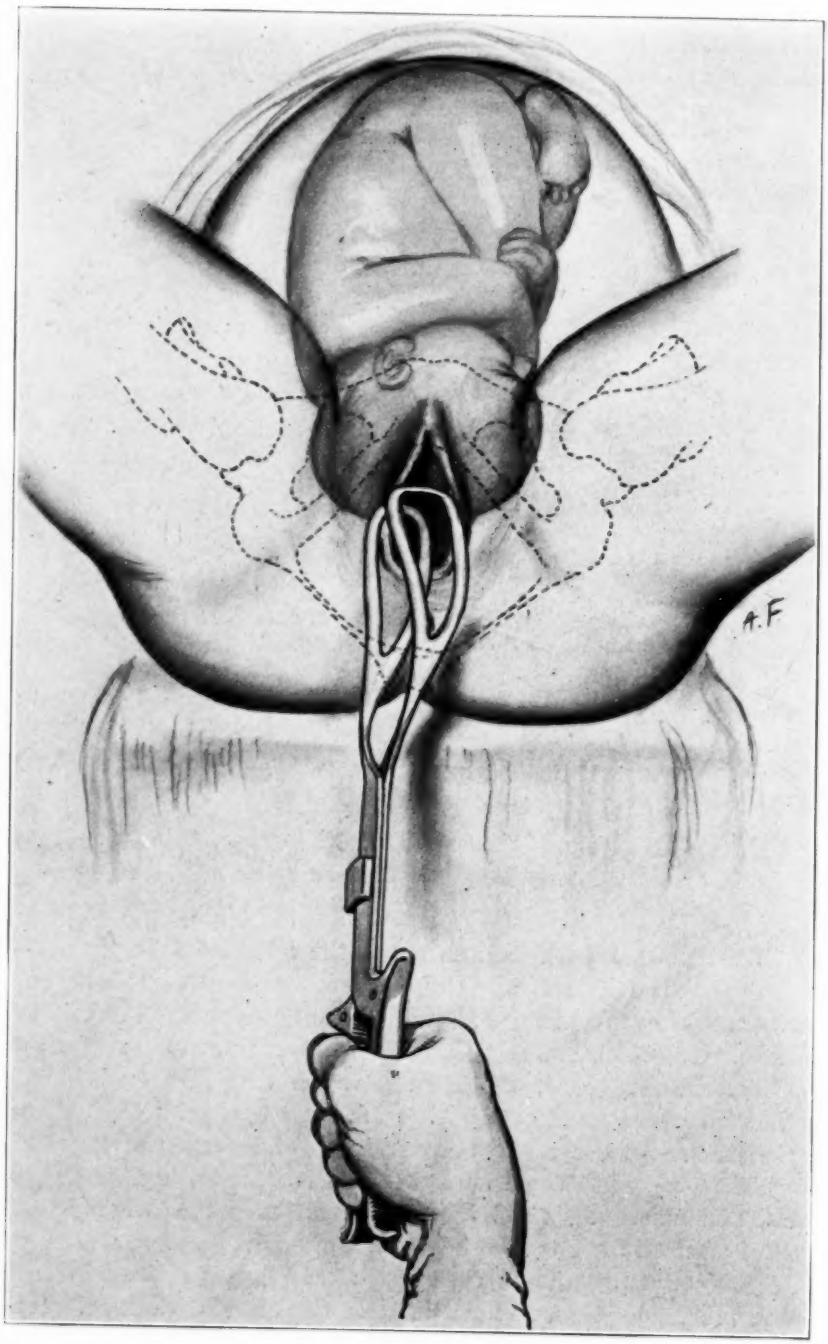


Fig. 1.

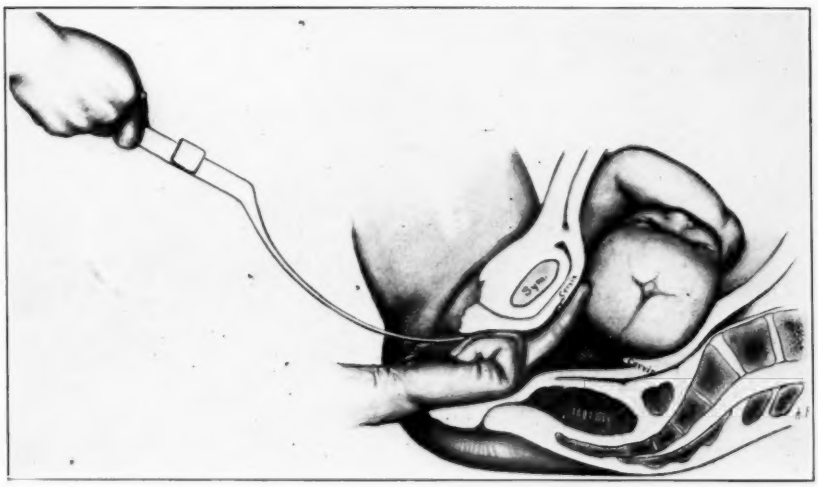
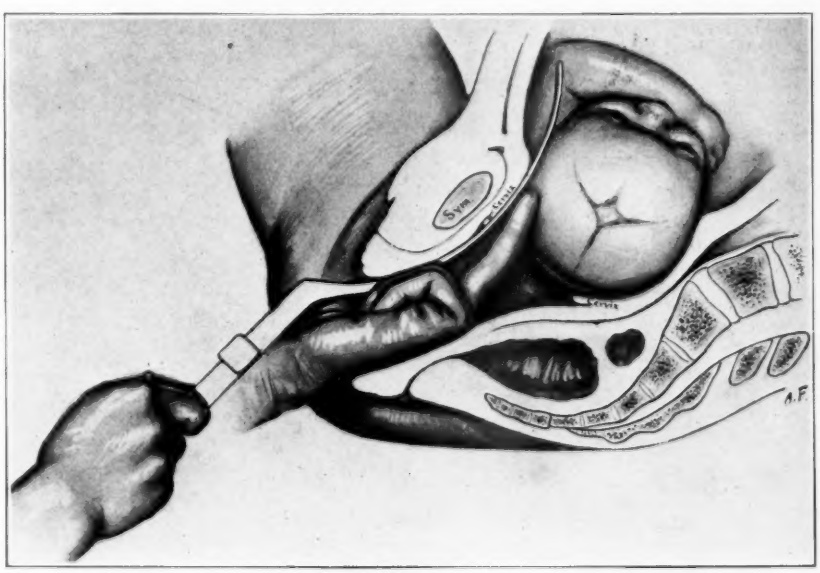


Fig. 2.

reality is a retrogression from the Levret forceps, reverting closer to the old short forceps of Smellie. In May, 1915, Kielland demonstrated his instrument before the Münich Gynecological Society and reported that since 1908, he had delivered 352 women with the new instrument.

In construction, the Kielland forceps varies from the classical forceps in three outstanding features. The most significant departure lies in the shape of the instrument, which lacks almost entirely a pelvic curve and resembles a bayonet. In place of the English or French lock, the Kielland forceps has a sliding lock which consists of an in-



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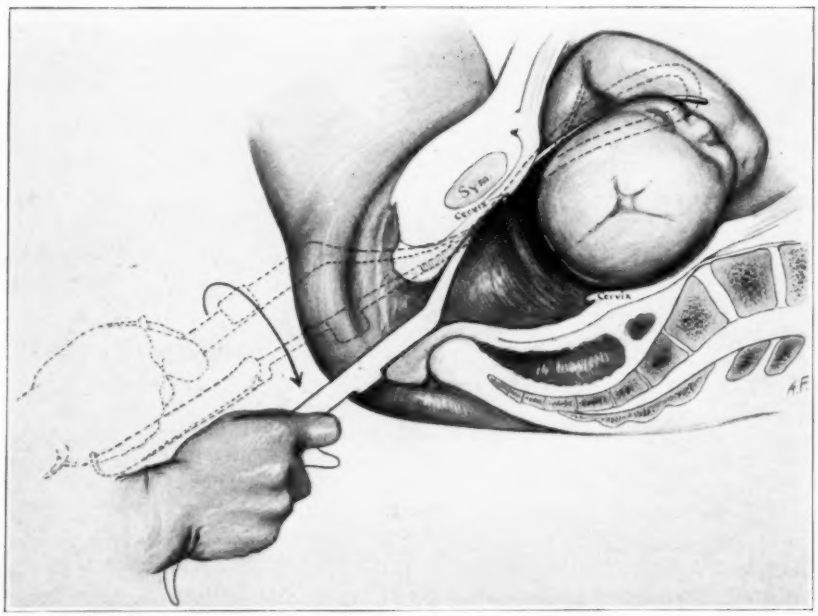

Fig. 4.

verted L-shape, square-edged hook, attached to the middle of the shank of the left branch of the forceps. The shank of the right branch is flat and slides up and down in this hook. On each handle is a small knob, which, as we will later see, is used to indicate the direction in

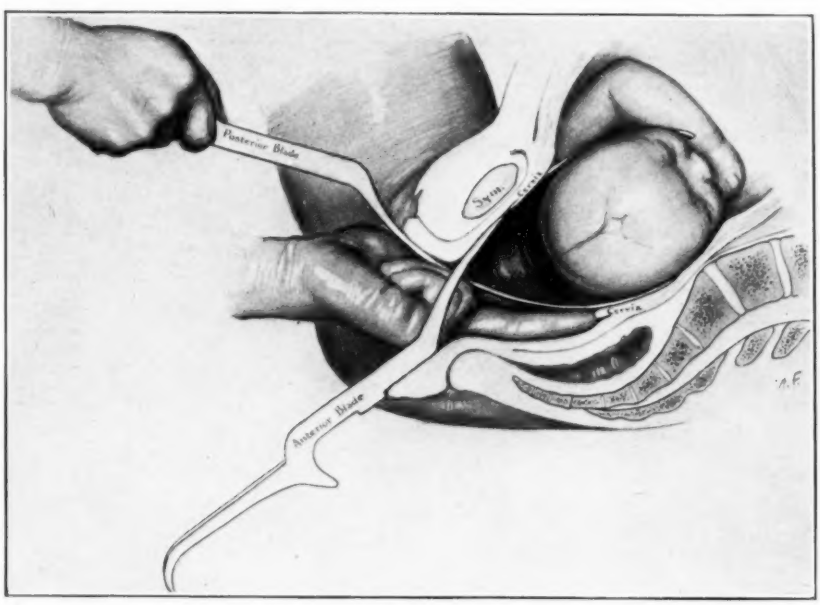

Fig. 5.

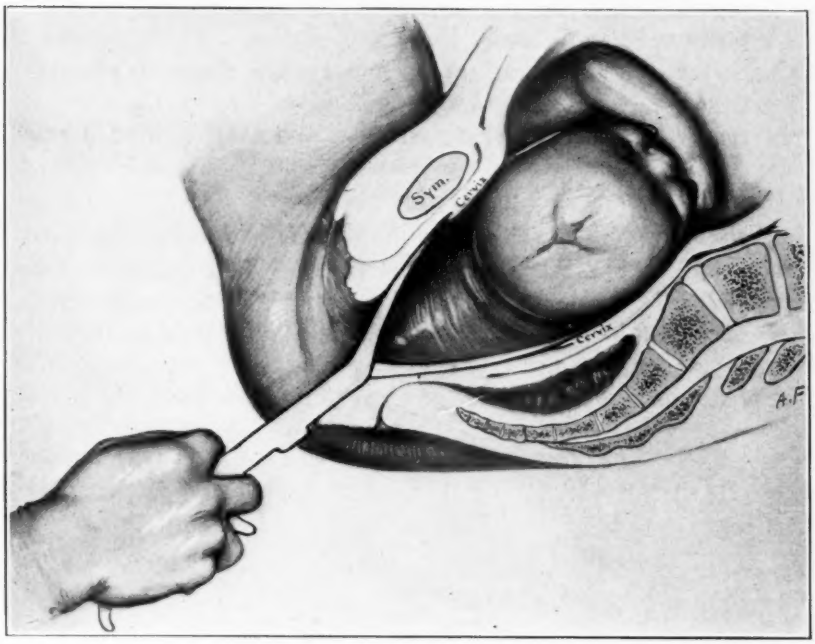

Fig. 6.

which rotation of each branch of the forceps is to take place. Another marked departure of the Kielland forceps from the classical forceps is its lightness of construction.

Besides devising the forceps already described, Kielland perfected a technic of application which differs essentially from that of the classical forceps.

In Vienna, the use of the Kielland forceps received a great setback through the adverse criticism of Shauta, and for several years its use

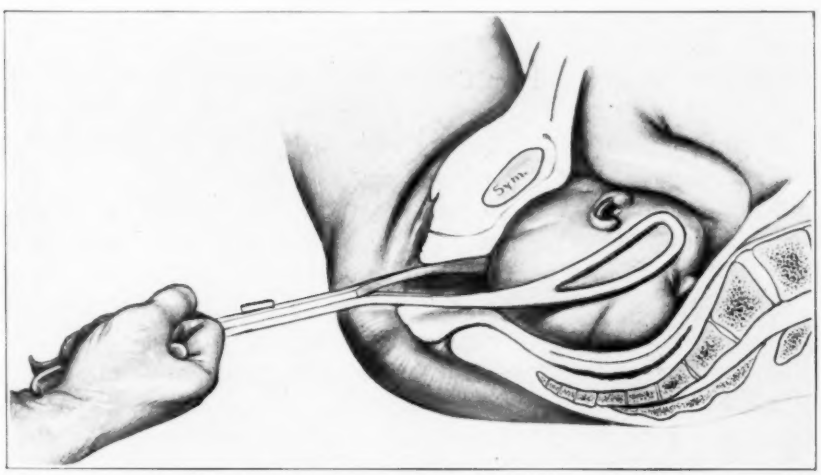

Fig. 7.

was kept up only by Wilhelm Rosenfeld, the head of the Lucina Hospital. Later, with the passing of Shauta, the younger men at the University of Vienna began to use the Kielland forceps extensively. It is practically due to the prolific writings and teachings of Heidler, a young and able worker at Kermauner's clinic at this university, that the Kielland forceps was popularized in Vienna.

Wilhelm Rosenfeld, with whom the author had the opportunity to work in the Lucina Hospital, claims that the bad results attributed to the Kielland forceps are not due to any fault of the instrument, but to the fact that in all probability, it was applied when marked disproportions or other contraindications to the use of forceps were present or when correct diagnosis of the position of the head, the direction

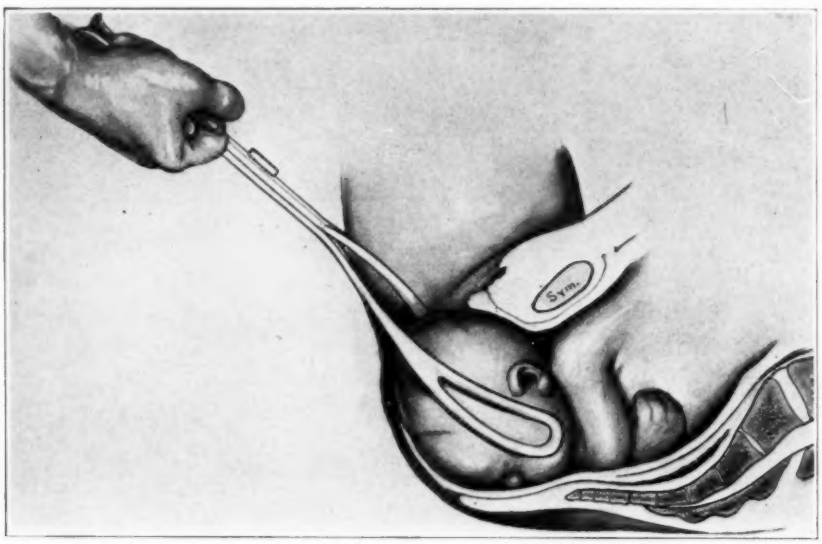

Fig. 8.

of the sagittal suture and position of the fontanels was not made. He personally delivered 256 cases without a single untoward result. While working with Heidler, I received practically the same expressions from him, namely, that there is not a single case which indicates the application of forceps, where the Kielland forceps could not be used more advantageously than any other model now employed. Even when the head is high in the birth canal, and a high application of forceps is to be performed, Heidler prefers the Kielland to the Tarnier axis-traction forceps. By doing an episiotomy, the handles of the forceps may be brought downwards, posterior and towards the coccyx, thus exerting traction in a straight line, in the axis of the pelvis. Von Schubert is also of the opinion that the Tarnier axis-traction forceps may be dispensed with and the Kielland forceps used in their stead.

When the head is situated high in the pelvis, the following technic is recommended by Kielland in applying high forceps.

The patient is brought to the edge of a bed or table and placed in the lithotomy position. The operator must make an absolutely correct determination of the level to which the head is descended, the direction of the sagittal suture in relation to

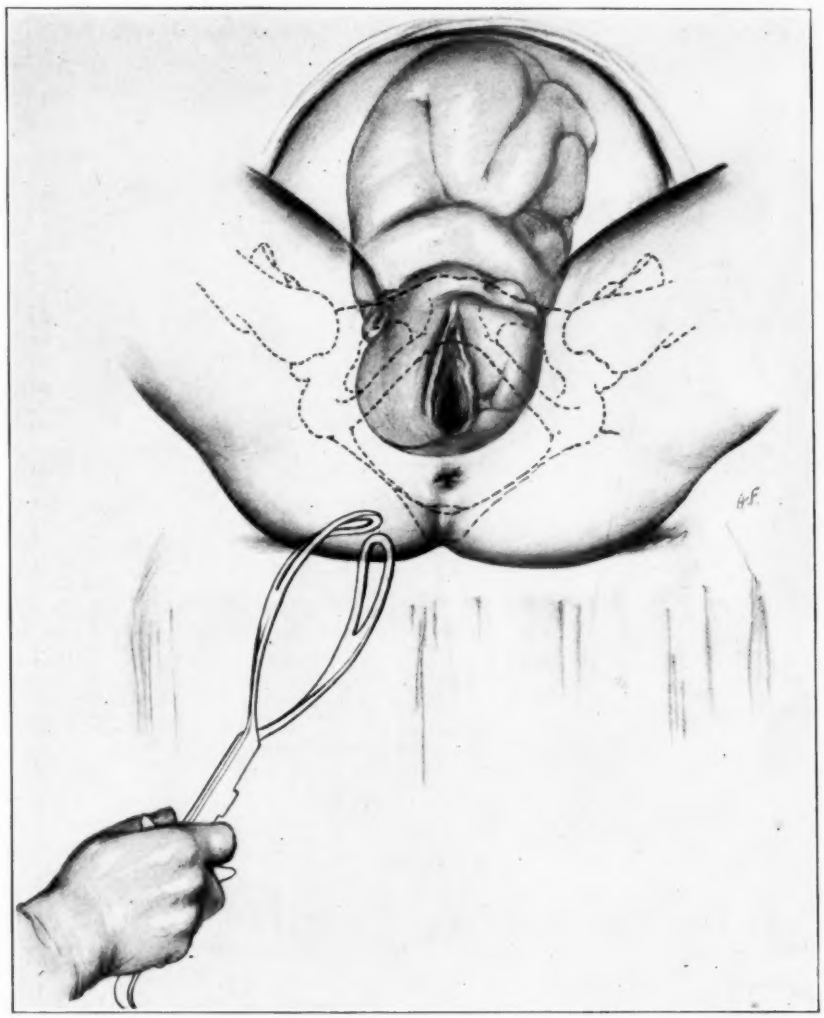

Fig. 9.

the pelvic diameters, and the position of the fontanels, all under narcosis. The right and left branches of the forceps are articulated and held in front of the external genitals in such a position that they can be visualized in the desired position over the parietals of the baby's head in the birth canal (Fig. 1). The concave margins of the blades are held towards the leading point of the head, which in vertex presentation is the occiput and in face presentation is the chin. As the forceps is held before the genitals, the upper branch, which is the one nearer the

operator, is selected to be introduced first and anteriorly into the birth canal. The anterior branch must always be introduced first.

The index and middle fingers of the left hand are introduced into the birth

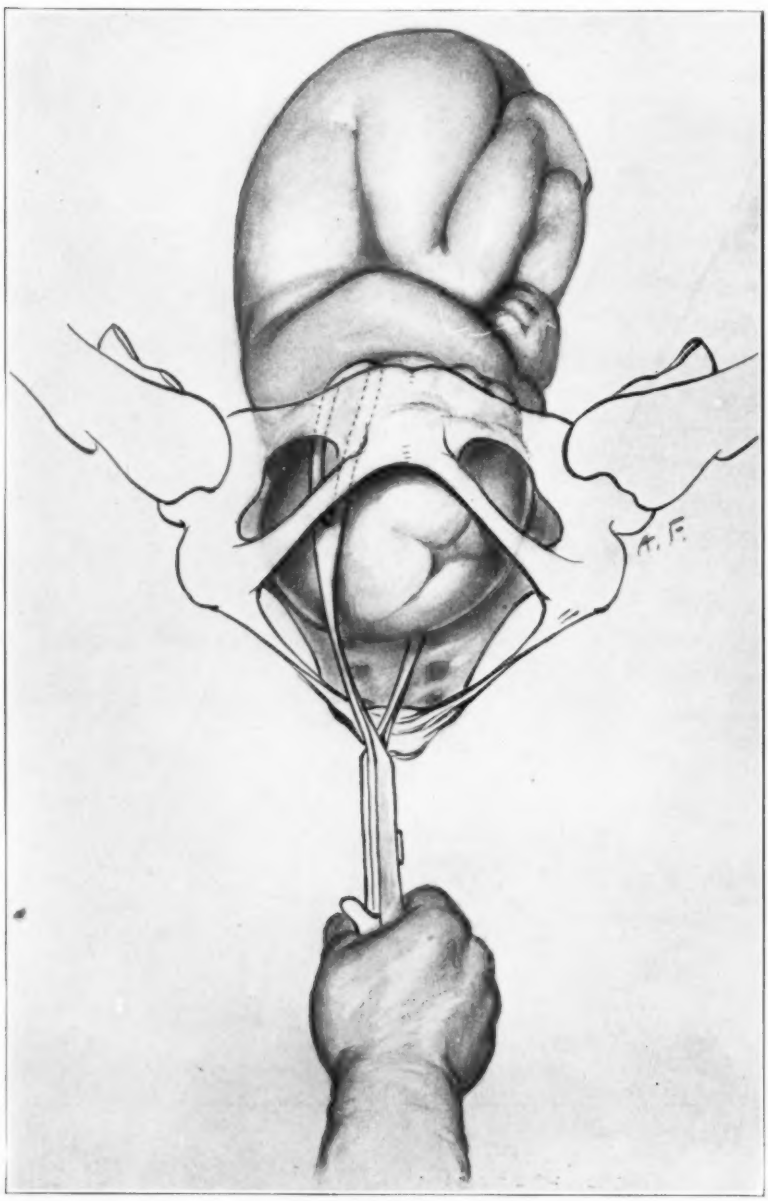

Fig. 10.

canal, behind the anterior margin of the cervix and in front of the head. The anterior branch of the forceps is held firmly in the right hand, not as one would hold the classical forceps, like a writing pen, but as one would grasp a sword (Fig. 2). The anterior branch is held with the cephalic concave surface directed towards

Fig. 11.

the ceiling. This branch of the forceps is guided by the fingers of the left hand. The blade is gently pushed in until it touches the head, guided by the fingers of the left hand under the symphysis and posterior to the anterior margin of the cervix, and in front of the head. At this stage of the procedure, the concave

cephalic surface of the blade is directed anteriorly and somewhat upwards (Fig. 3). As long as the operator feels that the blade is gliding in without resistance, it is pushed gently upwards. When the blade is introduced far enough, the shank of the anterior branch should rest on the posterior vaginal wall. The operator may now withdraw the left hand from the birth canal. As the blade is still with the cephalic surface anterior, the next step is the rotation of the blade, so that the cephalic concave surface comes in contact with the convex surface of the head. The rotation should take place in the direction of the side on which the concave margin of the blade points (Fig 4). Kielland has placed a small knob on each handle of the forceps, as has already been mentioned in the description of the instrument. This rotation then, is made to the side on which the knob is found. During rotation, the handle is held very lightly and is gently pushed upwards in the corkscrew fashion in the direction indicated. With rotation completed, the

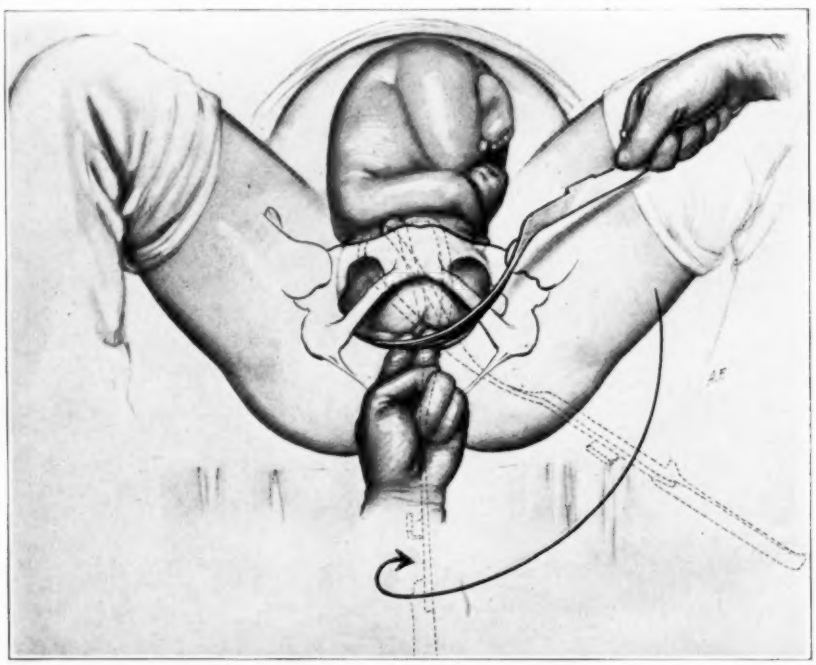

Fig. 12.

lock part of the shank rests firmly on the perineum (Fig. 4). The operator does not need the hand of an assistant to hold the handle of the anterior branch while the posterior branch is being introduced. The handle of the anterior branch should point downward and in the midline. At times, in high standing heads, the blade, after being rotated, lies somewhat to the side of the occiput, as shown by the deviation of the handle from the midline. A gentle push on the shank easily brings the handle to the midline.

The second blade of the forceps must be introduced posteriorly. The index and middle fingers of the left hand are introduced into the birth canal anterior to the posterior margin of the cervix. This branch of the forceps is held like a sword in the right hand and introduced posteriorly into the birth canal. The internal fingers guide the blade into place (Fig. 5). The handle of the posterior branch is introduced on that side of the anterior branch, in such a manner, that they will articulate without having to go through the awkwardness of recross-

ing. This can be predetermined by noting the side on which the lock is placed (Fig. 5). The posterior blade is gently introduced in front of the posterior margin of the cervix, into the birth canal, in front of or to either side of the promontory of the sacrum. At times, especially in contracted pelves, it may be difficult to place the posterior blade on as high a level as the anterior blade. Kielland states that the posterior blade is the only one which may render application difficult. When the posterior blade does not glide in with ease, the tip of the blade, in all probability, is pressing against the posterior wall of the pelvis. This shows that the handle of the blade is held too high, or the tip of the blade may be pressing against the head of the child, indicating that the handle of the forceps is too low. By elevating or depressing the handle of the posterior branch of the forceps, the operator will find the exact position where the tip of the posterior blade will slide into place without meeting the obstruction of the posterior wall of the pelvis or the baby's head. Force should never be employed to overcome this resistance. Because of the sliding lock, the branches may be articulated, even though the blades are not on the same level. With the first traction, the blades of the forceps will adjust themselves and come to the same level.

When the branches of the forceps are articulated, the blades are in the anteroposterior diameter (Fig. 6). The blades must be applied symmetrically over the parietal bones of the baby's head. The operator feels for the sagittal suture and determines its direction between the blades of the forceps which should be perpendicular to the sagittal suture. Traction is exerted downwards, in the direction in which the handles point. As the head descends in the birth canal, there is a tendency towards spontaneous rotation. The head can be rotated at will with the Kielland forceps but this is hardly necessary, as spontaneous rotation will take place when traction is exerted. However, at times it is desirable to rotate the head in the widest part of the pelvis, so that the sagittal suture comes in relation with the anteroposterior diameter before the head is pulled below the ischial spines. When one finds that the head does not rotate spontaneously, the head is rotated 90° from the transverse to the anteroposterior diameter of the pelvis. When the forceps is used as a rotator, traction should not be exerted simultaneously. The forceps are articulated, held securely, and rotated in the axis of the handles (Fig. 7). Some pelves will not permit a spontaneous rotation of the head and rotation must be performed by the operator, using the forceps as a rotator. When the head is rotated so that the sagittal suture lies in the anteroposterior diameter of the pelvis and is near the pelvic outlet, the blades of the forceps lie in the transverse diameter of the pelvic outlet (Fig. 7). When the head appears at the outlet, one is tempted to elevate the handles of the forceps, as is done with the classical forceps. The handles have a more downward direction than those of the classical forceps. If the handles of the Kielland forceps are elevated, the tips of the blades will slip up to the temporal regions from the cheeks of the child. Consequently the operator must exert traction only in the direction of the handles of the forceps and follow the direction given to them by the change in the position of the baby's head, as it appears under the pubis. (Figs. 7 and 8.)

In applying this forceps, it is necessary that the anterior branch of the forceps must be introduced first and rotated only in the direction of the concave margin of the blade, using the knob-like elevation on the handle as a guide.

Kielland does not consider it of much importance whether the right or left hand is employed to introduce the blade of the forceps. Like most men, who used this instrument, I always employ the right hand to grasp the handle of the forceps and the left hand as the internal guiding hand.

In occiput posterior, the forceps are held before the external genitals, as one would desire them in the birth canal, with the concave margins of the blades towards the leading point of the head, which is the occiput in the posterior posi-

tion either right or left. (Fig. 9.) As the leading point in right occiput posterior, is directed to the right and posteriorly and the forceps are held with the concave margins in that direction, the left blade would be uppermost and therefore the first to be introduced. The left blade is introduced in the same manner as described above, under the symphysis and is then rotated into place, and pressed gently to the right side of the pelvis, in order that the blade lies on the lateral aspect of the baby's head, with its concave margins to the right and posteriorly.

The right or second branch of the forceps is introduced posteriorly, but is directed to the front and somewhat laterally to the left sacroiliac synchondrosis. When the branches of the forceps are articulated, the lock is directed to the right and posteriorly. The blades in biparietal application are virtually upside down, that is, the convexity is anterior and the concavity posterior. (Fig. 10.) The branches of the forceps having been articulated, the handles are grasped firmly and the head is rotated with the forceps about 90°. The forceps being almost straight, rotation and extraction can be performed without removing and reapplying the blades, as is done in a Scanzoni maneuver. The forehead is brought to the left side somewhat posteriorly, and with subsequent traction (Fig. 11), the remaining rotation is brought about spontaneously.

In face presentation, as has already been mentioned, the Kielland forceps can be used to great advantage, not only when the chin is anterior, but even when it is directed more or less posteriorly, in which case, classical forceps are almost useless and contraindicated. The blades are applied in the same manner as in a vertex presentation, using the chin instead of the occiuput as the leading point. In the application, traction and rotation, one follows the same method as in an occiput posterior. Since the chin is considered the leading point, the concave margins of the articulated forceps are directed towards the chin.

SUMMARY

1. The operator must make a thorough examination and must accurately orient the baby's head, especially the leading point, be it occiput or chin.

2. The operator must determine which branch of the forceps is to be introduced first, using the concave margin as a guide when the articulated forceps are held before the external genitals in the position they would assume in a biparietal application.

3. The anterior blade is introduced first.

4. Rotation of the anterior blade is done according to a definite rule.

5. The posterior blade is the second one introduced, and enters posteriorly in the birth canal.

One who wishes to employ the Kielland forceps in obstetrical practice, should first acquaint himself with its use of a fetal skull in a bony pelvis, trying the different positions of the head, high, medium and low, with the occiput anterior, oblique and posterior and in face presentation. In this way the operator will be able to visualize the position of the forceps as they are applied to the baby's head *in utero*.

In medium or low forceps, Kielland recommends especially for beginners, the traveling or migrating method of application. The tips of the fingers are introduced into the birth canal, and placed on the sagittal suture, or better still on the anterior fontanel. (Fig. 12.) The handle of the anterior blade of the forceps is held like a sword, with the cephalic concave surface directed somewhat upwards.

While holding the anterior blade as just described, this is introduced along the fingers of the left hand towards the sagittal suture or anterior fontanel. The lower edge of the blade rests on the guiding fingers and the tip is directed towards the lateral wall of the pelvis. The handle is brought towards the under surface of the thigh and while the handle is pressed towards the thigh it is simultaneously depressed in the same direction as the hands of a wall clock (Fig. 12.) While the handle is depressed, the blade is pushed with the internal fingers upwards, under the symphysis pubis. The branch of the forceps is then in place, when the handle points directly downward and hangs free from under the symphysis. The handle should be pointing downwards toward the anus. (Fig. 12.) The posterior blade is introduced to that side of the anterior blade which will permit locking without crossing the blades. It is introduced posteriorly in the same manner that the posterior blade is introduced in the previously described technic.

In the medium or low forceps, according to Heidler, the migrating or traveling method of application may be used which is similar to the cephalic application of the classical forceps. In the application of the classical forceps, the posterior branch is introduced first and the anterior branch is introduced second. Contrary to this order of introduction, the anterior branch of the Kielland forceps is introduced first and the posterior one is introduced second. Heidler advises the introduction of two fingers into the birth canal which are directed posteriorly and laterally behind the baby's head. The anterior branch of the forceps is introduced along the guiding fingers and the blade is permitted to migrate anteriorly to the side of the baby's head. The blade is carried more anteriorly than it is in cephalic application of the classical forceps, so that they rest directly in front of the symphysis pubis. The posterior or second branch may be introduced directly posterior.

COMMENTS

There cannot be any doubt that the advantages that Kielland claims for his forceps are convincing to one who uses this instrument. It is easy to apply them and application can be made over the biparietal diameter. Lying in the long ovoid of the baby's head (in the occiputmental diameter) the blades grasp the head over a greater area and consequently during traction the forces of compression are distributed over this greater area and so this instrument will be less harmful to the head than when only the tips of the forceps grasp the head. The tips of the Kielland forceps reach to the cheeks where the only injury that might be caused by pressure would be a facial palsy which is transitory, and there are not likely to be any intracranial injuries. These forceps do not prevent rotation of the head but rather facilitate rotation because of the perfect fit. For this same reason rotation is easier as the head is turned within the soft parts and the soft parts are not dragged along. The possibility of infection is less as the operator introduces only two fingers as a guide instead of the entire hand. In posterior positions introduction of the forceps is made but once instead of twice as in the Scanzoni maneuver.

Injuries to the maternal parts which are reported in literature, such as laceration of the bladder, uterus or introduction of the anterior blade between the cervix and the vaginal wall thus making a false passage, are largely avoidable if the blade is introduced cautiously.

During introduction or rotation of the blades no undue force should be used upon encountering the slightest resistance but rather the blade should be removed and the cause of the impediment determined. I am convinced that less muscular strength is required in the application of Kielland forceps than in any of the ordinary forceps. Brutal force and obstetrics are incompatible. Forceps should not be introduced or rotated during a pain. It is also to be emphasized that the Kielland application of the forceps is superior in a flat pelvis when the anteroposterior diameter of the pelvis is shortened and the head is standing transversely in the pelvis by shortening the biparietal (as previously noted), whereas if you use classical forceps and have them laterally in the pelvis, the occipitofrontal diameter is compressed and shortened while the biparietal is lengthened. This increases the obstacle at the short anteroposterior diameter of the pelvis. The anterior blade lying behind the symphysis pushes the head away from the pubis and the blade glides conveniently over the plane of the pubis. I was especially gratified with the Kielland forceps in three old primiparae, the first with a persistent occiput posterior where the forceps was applied upside down. It was surprising how easily the head lent itself to rotation and later extraction. The second was a face presentation. The third was an eclamptic having had one convulsion, the cervix not fully dilated, head in the transverse diameter of the pelvis having passed with the greatest circumference through the inlet. The dilatation was completed by inserting a Müller bag and then the regular Kielland technic was employed. A living child was obtained without any injury to the child or mother. However, on account of greater haste an episiotomy was performed. It should be noted that the shanks of the forceps lie over the anus and care should be taken not to infect them or the hands while grasping the forceps.

CONCLUSIONS

Tarnier forceps can be dispensed with as the Kielland forceps combined with episiotomy are more effective as an axistraction forceps. There is no injury to the baby's head other than a possible paresis of the facial nerve which is as a rule transitory. There are less injuries to the maternal parts. The Kielland forceps exacts from the obstetrician a correct diagnosis and therefore compels him to examine the patient carefully and develops thoroughness in his work. There is no objection to the use of this instrument by any one who is acquainted with the use of classical forceps provided he has been instructed on the manikin and has applied them on the living subject under the guidance of a trained obstetrician. The author would therefore advise training the younger men in the hospitals to its use. They should be cautioned against the dangers of applying any forceps without making a correct diagnosis as to the position of the fontanels and direction

of the sagittal suture. They will then realize that it is dangerous to apply classical forceps without a proper diagnosis and even more dangerous the Kielland forceps. Fully convinced of the merits of the Kielland forceps, I still cannot agree with the men who use this instrument on floating heads and on heads whose greater circumference has not passed the inlet. Such practice is always wrought with great danger even in the hands of skilled men. Above all, unless the accoucheur undertaking such an application is prepared to recognize and capable to cope with the dangers of complications that are likely to arise, he may sacrifice the lives of mother and child and besides this throw into disrepute this serviceable instrument.

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HEMORRHAGE IN THE LAST TRIMESTER OF PREGNANCY*

By H. C. Burgess, M.D., F.A.C.S., Montreal, Canada

IT is my intention in this paper to review the cases of hemorrhage that occurred in the Montreal Maternity between the years 1906 and 1924 inclusive. As shown by Table I, I have divided hemorrhages into antenatal and postnatal. The antenatal is divided into the accidental and the unavoidable; the accidental again into the concealed and the apparent, and the concealed may be due to four conditions.

In our series of 18,720 cases delivered, we find that an accidental hemorrhage occurred eighty times, or 0.43 per cent, and a study of Table II shows that of these eighty cases of accidental hemorrhage, seventy-six were of the apparent type with three maternal deaths, and four of the concealed variety with an equal number of fatalities.

An analysis shows that the etiologic factors leading up to these hemorrhages in the great majority of cases are unascertainable, and yet there is present in sixteen of the eighty, a definite history of the symptoms and signs of toxemia, as manifested by edema, albuminuria, elevated blood pressure, etc. This toxemia existed as a predisposing cause in all fatal cases, and in this regard our results confirm the observations of most Continental and European obstetricians. In seventeen cases the fetus was macerated, and undoubtedly in a great number of cases accidental hemorrhage is preceded by a lethal termination on the part of the fetus. Fibroids of the uterus are probably the cause of the hemorrhage in two cases, as are twin pregnancies in a like number, and a further study of the cases occurring in the Royal Victoria Hospital, shows that antepartum hemorrhage was occasionally seen during the influenza epidemic of 1918 and also as a complication in jaundice and cardiac disease. It is interesting to note that the

*Read, by invitation, at a meeting of the New York Obstetrical Society, March 10, 1925.

comparative frequency with which this accidental hemorrhage occurred in primipara, twenty-six out of the eighty cases belong to this category; while in the unavoidable hemorrhage of placenta previa we find a considerably fewer number in 148 cases.

While the etiology of the concealed and apparent accidental hemorrhage is the same, when the diagnosis is approached one is at the parting of the ways; the apparent variety must be differentiated from that of placenta previa, and will be dealt with a little later on, while the concealed variety must be distinguished from grave abdominal conditions such as a ruptured uterus, late ectopic pregnancy, twisted ovarian cyst and acute peritoneal involvement.

In our series of four cases of concealed hemorrhage, the most constant symptom was an attack of sharp abdominal pain and abdominal palpation of the uterus showed it to be very tender; there was always an inability to outline the fetus or to hear the fetal heart,

TABLE I

- Hemorrhage
  - Antenatal
    - Accidental
      - Concealed
        - Behind placenta
        - Behind membranes
        - In amniotic cavity
        - Behind closely fitting head
      - Apparent
    - Unavoidable
      - Placenta previa centralis
      - Placenta previa lateralis
      - Placenta previa marginalis
  - Postnatal

but the ligneous condition of the uterus, which is so often quoted, is not recorded as a constant sign. The symptoms of shock or collapse were invaritbly present, and were manifest by subnormal temperature, weak, thready pulse and air-hunger.

For the proper treatment of this condition it is necessary to have a sound grasp of the underlying principles. The etiologic factor in both the concealed and apparent variety is probably the same, and, in my judgment, is usually a toxemia. If this premise is based on fact, one of the most important adjuncts of treatment is *prophylaxis* or antenatal care, and in discussing the value of this antenatal care, the possibility of hemorrhage occurring in a toxic pregnant woman should assume the same importance as the development of an eclamptic seizure. Again our series of cases shows that the presence of small apparent antenatal hemorrhages, has been occasionally the forerunner of a rapidly developing toxemia.

Our experience with the concealed variety is of necessity limited by its rarity, as it occurred only four times. A short résumé of the treatment undertaken is interesting and profitable.

TABLE II

TYPE	GRAVIDA		EARLY RUPT. MEMB.	ANTEPARTUM OPERATION						RESULTS				
										Mother		*Child*		
	Primip.	Multip.		Spon.	Breech.	Forc.	V. & E.	Abd. Hyst.	N.D.	Good	Died	Good	Died	Mac.
Appar. Accd. Hem. 76	25	51	11	64	7	1	1	1	2	73	3	28	29	17
Concealed 4	1	3	0	0	1		1	Porro 1	Vag. Hyst. 1	1	3	0	1	3
80	26	54	11	64	8	1	2	2	3	74	6	28	30	20

Total No. delivered in hospital 18720
Total No. accidental hemorrhage 80
Percentage total 0.43 per cent

CASE 1.—Para X; aged thirty-six years. Gave a history of serious hemorrhages in preceding pregnancies. Patient was first attacked by severe abdominal pain and in six hours a trickle of blood *per vaginam* was noted. She was admitted to the hospital in a state of collapse. The cervix was thick and a Porro-cesarean was performed. The mother died shortly afterwards, and the child was macerated.

CASE 2.—Para X; aged forty-one years. A large quantity of albumin and casts was found in urine.

On admission, temperature was 96° and pulse 132. She was pale and air-hungry. Abdomen was tender to palpation, uterus not board-like, position not outlined and fetal heart not heard. The cervix was found half dilated and the membranes unruptured. Under nitrous oxide and oxygen a large quantity of liquor amnii was freed, and further manipulation released 1000 c.c. of blood. An internal version was performed and a macerated fetus delivered, but the patient died in spite of stimulation.

CASE 3.—Para I; aged thirty-four years; no toxemia. Patient was seized with severe pain in right lower quadrant; fibroids could be felt in the fundus. The position of the fetus could not be ascertained nor the fetal heart heard. The membranes were ruptured, and a breach extraction of a deadborn infant was performed. The placenta with large retroplacental clots was immediately delivered. The patient recovered, and has since been delivered of a living child normally.

CASE 4.—Para XI; aged forty-three, with evidence of toxemia. Patient was seized with severe abdominal pains and a vaginal hysterectomy performed with a fatal maternal and fetal result.

To these four cases taken from the records of the Montreal Maternity might safely be added two other cases.

Case 5, occurred in the Gynecologic Service of the Royal Victoria Hospital, where the uterus grew from the size of a six months' pregnancy to full term in a few hours. A Porro-cesarean was performed, with a favorable maternal result. The fetus nonviable was deadborn.

CASE 6.—A multipara, was seized with severe abdominal pain and collapse. Her medical attendant, finding the cervix partially dilated, attempted a version and extraction. The placenta was floating free in the uterine cavity, and the patient died undelivered.

The accepted treatment of concealed antepartum hemorrhage is immediate delivery, and usually by the abdominal route. Statistics show a maternal death rate of 50 per cent to 60 per cent, and this, with our own findings, leads me to the conclusion that the time has arrived when our attitude regarding this type of case should receive serious reconsideration. The patient suffering from a concealed hemorrhage is usually weakened from an immediate loss of blood. She is usually in a state of shock from the crushing pain of the forcible distension of a hollow viscus, and in addition, there is usually a high degree of toxemia. I doubt if there exists in surgery today any other condition where under these adverse circumstances a major operation would be undertaken, and while it may be possible to justify this radical procedure, it should be undertaken only after a conscientious analysis of the following conditions:

1. Is it possible after a rupture of the membranes and an evacuation of the spilled blood, to control by a vaginal pack and a closely-fitting abdominal bandage the loss of further blood into the uterine cavity?

2. Is there any danger of a rupture of the degenerated uterine muscle, thus allowing an escape of blood into the abdominal cavity?

3. To what extent and in what percentage of cases does an infiltrating hemorrhage take place in the uterine muscle planes and broad ligaments?

If it is decided that the uterine distention can be relieved by a rupture of the membranes, and the bleeding checked by the mechanical means of a vaginal pack and abdominal binder, and the toxemia lessened by appropriate treatment, then it appears to me that a major abdominal operation is unjustifiable. If, however, it is the consensus of opinion that it is impossible to prevent a refilling of the dilated uterine cavity by fresh blood clot, and if a uterine rupture exists as a real entity, then without any hesitation an immediate abdominal section is imperative.

Apparent accidental hemorrhage occurred seventy-six times and seventy-one of these cases delivered themselves spontaneously. There was one forceps, one version and one abdominal hysterectomy, while two cases were not delivered. The maternal deaths were three in number, and an analysis of these deaths shows one to have been due to sepsis, one admitted in extremis and died undelivered, and the third died six hours after a version and extraction and manual removal of placenta.

From these results I am convinced that the treatment of an apparent accidental hemorrhage, thereby showing *that the uterine muscle is still capable of functioning*, can be summed up in seven words, viz.—"diminish the size of the uterine content." If the cervix is dilated or dilatable, the immediate delivery of the individual by a forceps or version is indicated. If not, the simple rupture of the membranes, with or without a subsequent packing of the vagina, the application of a firm abdominal binder, the giving of pituitrin if the action of the uterine muscle is sluggish, or heroine in small doses if unduly active, will give the best results as far as the mother is concerned, and in all cases of hemorrhage, I am fully convinced that what is best for the mother is best for the child. The appropriate treatment to combat shock and to replace the fluid contents of the vessels, is, of course, indicated. In this type of case I would decry the rushing into a cesarean section or an accouchement forcé, as unwarranted, unneeded, and fraught with danger.

Placenta previa occurred in 148 patients or 0.78 per cent of cases. The central variety is recorded as occurring thirty-one times, the lateral fifty-three times and the marginal sixty-four times. Placenta

previa is more frequent in multipara and increases with the number of children and also their frequency.

I cannot say that a study of our series of cases throws any light upon the etiology. The fact that one sees from time to time an early abortion due to placenta previa would strengthen the belief that a low implantation of the ovum was responsible for some cases, and, in my opinion, is the true cause of placenta previa. The belief that it is due to a placenta membranacea or spreading out of the placenta to obtain more nourishment for the child is not borne out by the study of our cases in the Montreal Maternity.

It is remarkable that the diagnosis of placenta previa is made almost entirely from the symptoms of a painless hemorrhage occurring often at night, and the records fail to show one incident where a placenta previa had been diagnosed before the onset of a hemorrhage. Confirmatory evidence as to the existence of a placenta previa can be obtained both by abdominal and vaginal examination. The fact that the presenting part is held well out of the pelvis, and the hearing of the uterine souffle over the symphysis, while by vaginal examination the softened cervix, the pad of tissue felt between the examining finger and the presenting part, and the increased pulsation of the uterine arteries, will all aid in the diagnosis. The real presence of a placenta previa, however, can only be confirmed by passing the finger into the internal os and demonstrating the presence of placental tissue.

It is questionable if very much can be obtained by prophylaxis in placenta previa. The proper care of her previous pregnancies and labor, guarding against subinvolution and displacements may accomplish more than we are aware of, while means for limiting the number of children and the rapidity with which they follow one another, may considerably diminish the number of cases.

When the diagnosis of placenta previa has been made, what shall be our attitude regarding the prolongation of that pregnancy? Shall we advise a termination, no matter what the period of pregnancy may be, or shall we advise its continuation in the hope that a viable or better developed infant may be obtained? A study of our cases shows that the first hemorrhage, while it may be profuse is rarely, if ever, fatal. It shows also that repeated hemorrhages come on without warning and are often very severe, and the patient is so weakened that her resisting power is greatly diminished, and she is in no condition to stand the shock of labor. Another point is, that while one is willing to admit the vagina is sterile as regards pathogenic bacteria, yet, when there is a constant discharge of blood the tract soon becomes a culture ground for virulent organisms, and so gives rise to many of our septic cases. Bearing these two factors in mind, I believe that one should always advise the interruption of a preg-

nancy in a well authenticated case of placenta previa, no matter what the period of pregnancy may be. Whether one is justified in dilating up the cervix for diagnosis and so endangering that pregnancy is still another question. Personally this question has never arisen, and in this review I failed to find one incident where that maneuver had been practiced.

What is the treatment of placenta previa? It is impossible to answer that question by any single statement. The treatment of placenta previa depends on three conditions:

1. What is the type of placenta previa with which you are dealing?
2. What is the condition of the cervical canal?
3. What facilities for treatment are at your disposal?

The simplest variety is the marginal of lateral placenta previa, where the edge of the placenta can be felt through the internal os. We have found that the simple rupture of the membranes, the holding of the head down against the free margin of the placenta, either with the hands or a tight Scultetus' bandage, and the giving of small doses of pituitrin to aid in the uterine contraction, is usually all that is necessary to control the hemorrhage.

Where the placenta is nearly across the cervical canal, which is dilated enough to easily admit the hand, the rupture of the membranes and the bringing down of a leg to tampon the cervix, the application of a weight and pressure from above, will soon make it possible to extract the rest of the body and the head.

The third type that we meet with clinically is the central placenta previa with elongated, nondilatable cervix, but which will admit the introduction of two fingers. Here the avenue of approach depends on what facilities you are able to command. The older operation by either working up the side of the placenta, or tunnelling a passage through it to rupture the membranes, and grasping a foot, to perform a Braxton-Hicks version, was practiced in twenty-one of our series of cases with no maternal deaths. In more recent years, and where it is obtainable, the passing of a hydrostatic bag through the cervix and into the uterine cavity, has given equally good results and is usually more easily accomplished.

The fourth type is the central placenta previa, occurring often in a primipara, where the cervical canal will not admit of the passage of even one finger through the internal os, and here again the treatment depends upon the facilities at hand. In a hospital, or where the proper technic can be controlled, a cesarean section is probably the best solution, but if this is not possible, the packing of the cervix and vagina with gauze, the application of a proper fitting bandage to the abdomen and the giving of some sedative, such as heroine or codeine, will probably control the bleeding until the cervix softens and dilates sufficiently to permit of other operative measures.

What usually happens when one is called to a case of hemorrhage? The patient is found lying in bed in a pool of blood, dark, clotted, and with no evidence of any fresh hemorrhage. After a preliminary taking of the pulse, the medical attendant washes his hands and proceeds to ascertain the cause of the hemorrhage. The blood clots are removed from the vagina, the finger is passed through the cervix and manipulated until the diagnosis is made, then the hand is withdrawn followed by considerable bright bleeding; the uterus is stimulated to contract, more placenta is separated from the uterine wall, and before the condition can be controlled, the patient's life is jeopardized or lost.

I speak from experience. I have seen, as I am sure many of you have, this very thing happen time and time again. If this paper has any merit at all, it is to urge this one point, viz.: never disturb or examine a suspected case of placenta previa until you are prepared to deal with any condition you may find; have proper assistance for the giving of an anesthetic; be prepared to pack the vagina; be prepared to insert a bag or at least rupture the membranes and bring down a leg; be prepared to stimulate your patient. Then place her on a table with the proper elevation and in front of a good light, bearing in mind the great danger of infection, try to obtain a surgically clean field, catheterize, remove the blood clot from the vagina, examine through the cervical canal, bearing in mind that what you do depends on the type of placenta previa with which you are dealing, on the dilatability of the cervix, and the facilities at your disposal. At this point, let me urge upon you not to do too much. Many lives are lost by the finding of a cervix partially dilated—the hand is passed through, a version is done, the child is rapidly extracted—the head tears through the blotting paper-like cervix and lower uterine segment, with the result that the patient bleeds to death from an *inflicted wound*, while if left alone she might have escaped nature's mistake in the implantation of a fertilized ovum.

When the fetus is born, how are we to deal with the placenta? Shall we remove it at once manually, or shall we leave it for a natural separation? I believe that the proper procedure depends on whether, after the birth of the fetus, the bleeding continues or not. If the bleeding still continues, the placenta should be removed manually; if no bleeding is going on, then leave it and wait for a natural separation. Following the birth of the placenta, and if the proper assistance is available, the cervix should be inspected, a hot intrauterine douche given, and the uterus and vagina packed gently with antiseptic gauze, which remains *in situ* for twelve to sixteen hours. Unavoidable hemorrhage is a serious condition and the results are far from satisfactory. But I believe the following factors tend to increase the fatal results in respect to both mother and child.

(a) Sufficient attention is not given to the initial hemorrhage and we wait for the devitalizing effects of a second or third hemorrhage.

(b) Patient is examined vaginally before one is ready to deal with the condition.

(c) The tendency is to do too much. To check the hemorrhage should be our only aim.

(d) Technic is not rigid enough. Infection is too often carried to the low lying placental site.

A study of our cases of placenta previa, Table III, shows that out of 148 cases, fifty-two delivered themselves normally or aided by an artificial rupture of the membranes, with only one maternal death,

TABLE III

OPERATION	NO.	MOTHER		CHILD		TYPE		
		Good	Died	Good	Died	P.P.C.	P.P.L.	P.P.M.
Spon. Delivery	34	34	0	22	12	0	12	22
(A) Vag. Pack	1	1			1	0	1	0
(B) Rup. Memb.	17	16	1	8	9	1	6	10
Version and Ext. Ind.	6	5	1	3	3	2	4	
(A) Acc. Forcé	16	12	4	11	5	12	4	
(B) Rup. Memb.	14	14	0	7	7	4	5	5
Breech								
(A) Rup. Memb.	6	4	2	1	5	0	5	1
(B) Acc. Forcé	1	1	0	0	1	1		
Braxton-Hicks	21	21	0	4	17	4	3	14
Bag Ind.								
(A) Normal Del.	5	5	0	4	1	1	1	3
(B) Vers. and Ext.	11	11	0	6	5	0	7	4
(C) Forceps	1	1			1		1	
Forceps	3	3		2	1		1	2
Cesarean Sect.	12	10	2	8	4	6	3	3
Total	148	138	10	76	72	31	53	64

Total No. of confinements	18720
Total No. of placenta previa	148
Percentage	0.78 per cent.

but with the loss of twenty-two infants. An accouchement forcé followed by a version and extraction accounted for sixteen cases with four maternal deaths, a result that condemns absolutely the forcible dilation of the cervix with the extensive lacerations that are bound to take place. The operation of Braxton-Hicks version was performed in twenty-one cases: (practically all in the period 1906 to 1912), with no maternal deaths but with the loss of seventeen infants. In later years this operation was supplanted by the use of the hydrostatic bag. There were sixteen such cases with no maternal deaths and a much more improved fetal mortality. Cesarean section, while giving far better results than that of forcible dilation of the cervix, showed out of twelve cases the loss of two mothers and four babies.

Hemorrhage postnatal, occurred in sixty cases out of 18,720 confinements in the Montreal Maternity, between the years 1906 to 1924 inclusive.

As shown in Table IV, the postnatal bleeding comes either from a partially separated placenta, retained cotyledon, atony of the uterus or laceration of the birth canal. A detailed diagnosis is necessary for the proper treatment of this condition and it can usually be ascertained by the time the bleeding begins and its type.

If the bleeding follows immediately after the birth of the fetus, the hemorrhage may be either from the placental site or from an injury to the birth canal. But, if there is a clear interval following the birth of the child before the hemorrhage begins, the possibility of injury to the birth canal can be ruled out. The clinical significance of this clear interval is not generally understood, but, I observe it most carefully, and it has saved me many times from a serious and needless obstetric operation.

Again the type of the bleeding is important. That from a lacerated cervix is bright in color and continuous; that from a partially sep-

TABLE IV

Postnatal Bleeding	Placental site	Partially separated placenta Retained cotyledon Atony of uterine muscle Paralysis of uterine muscle
	Laceration of birth canal	

arated placenta is darker, clotted in part, and greatly increased during a uterine contraction. Bleeding from atony of the uterus is a miniature Niagara Falls.

The treatment of postpartum hemorrhage is largely prophylactic. If one would only remember that there can be no bleeding until the placenta begins to separate, that the placenta is separated by uterine contractions, and that the contractions begin fifteen or twenty minutes after the fetus is born and are responsible for the closing off of the placental sinuses, then it becomes manifestly plain that our duty is to imitate nature, and for this length of time after the birth of the fetus to sit quietly down, steady the uterus only (but on no account massage it), and wait until the waste products of the muscle cells have been eliminated, their tone recovered, and are in readiness to finish the day's work. How easy to say, but how hard to practice! How often as soon as the child is born, do we immediately begin to rub and massage the uterus, partially separate the placenta, or so expand the uterus that atony takes place—and then are called upon to fight with all our power to save the patient's life!

It occasionally happens, however, that in spite of our best endeavors the placenta partially separates, the normal contraction of the

uterus is interfered with, serious bleeding is taking place, and the question arises as to the proper method of procedure. Before attempting anything rash, pause long enough to pass a catheter and draw off the urine that may be preventing the normal contractions of the uterus. If the bleeding persists, it becomes imperative to empty the uterus, which can usually be accomplished by Credé's method, with or without an anesthetic, or if necessary, a manual removal under strict aseptic precautions.

The most alarming, and most dangerous postnatal bleeding is that due to atony of the uterus, which may occur within the hour, coming on often without warning, and calling for prompt, energetic and properly applied treatment. It may be that I have been especially fortunate in hemorrhages of this type: As superintendent of the Montreal Maternity for two years, and actively engaged in obstetrical work both public and private for nearly fifteen years, I have never been called upon to pack the uterus for postnatal bleeding, to pass the hand into the uterus, or to give an intrauterine douche, and yet I have had to face serious hemorrhages, thus far without a lethal termination.

The method I employ is as follows: When the placenta is born it is carefully inspected for retained cotyledons, so that in the event of a hemorrhage I am able to eliminate that factor. A sterile towel at the beginning of the actual delivery is put aside and kept for this emergency, and no one is allowed to disturb it. Called suddenly to the bedside, the first maneuver is to quickly place the left hand well up on the abdomen, and by rapid pressure downwards all blood is expelled from the uterus and vagina. Immediately this is done the sterile towel, held in the right hand, is crowded against the perineum, closing the vulvar orifice, and by pressure from above and below all bleeding can be checked. Massage of the uterus is not attempted, but firm pressure is maintained. The foot of the bed is elevated,—which is most important. The legs are bandaged, ergot and pituitrin are given and salines intravenously, subcutaneously, or *per rectum*. The advantages of this simple method are, the rapidity with which the already spilled blood in the uterus and vagina is got rid of; the rapidity with which pressure can be applied both above and below; the mind is left free to direct the activities of others, and the danger of direct infection is reduced to a minimum.

There is no question in my mind that by this simple method you can control the bleeding. If the uterus fails to contract, arrangements can be made to pack or to do a hysterectomy.

The hemorrhage that follows the laceration of the birth canal is treated along general surgical lines, requiring that the patient be placed at a proper elevation, and the advantages of sufficient assistance, suitable instruments, and a good light be obtained. It is well to inspect first the introitus, in the event of failure to find the origin

TABLE V

TYPE	NO. OF CASES	GRAVIDA		Plac. Man. Removed	POSTNATAL OPERATIONS				RESULTS				
									Mother		*Child*		
		Prim.	Mult.		Uter. Pack.	Uter. Douche	Credé	Lac. of Birth Can.	Good	Died	Good	Died	Mac.
Partial sep. of placenta	21	8	13	19	1	2			20	1	18	3	0
Atony of uterus	38	30	8		1		1		37	1	36	2	0
Lacer. of birth canal	1	1		1			1		1			1	0
Total	60	39	21	20	2	2	2	1	58	2	54	6	0
Manual removal placenta No bleeding	24	14	10	24					24		18	5	

Total No. of confinements 18720
Total No. of post. part. hem. 60
Percentage .32 per cent

here, the anterior and posterior lips of the cervix are grasped with volsellum forceps and brought into view, carefully inspected and the bleeding point controlled, not by an individual ligature, but by a deeply laid suture taking a good bite of anterior and posterior lips, and tying moderately tightly. The vaginal walls are also inspected, and the uterus and vagina packed with gauze.

By referring to Table V, it will be seen that twenty-one cases of postpartum hemorrhage were due to a partial separation of the placenta, thirty-eight to atony of the uterus and one to laceration of the birth canal. The cases occurred in thirty-eight primiparae and one multipara, with the loss of one mother. The manual removal of the placenta for other purposes than bleeding was necessary in twenty-four cases, and with no maternal deaths.

118 Crescent Street. (*For discussion see page* 134.)

THE USE OF MERCUROCHROME IN OBSTETRICS*

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THE annual mortality from childbirth in the United States reaches the appalling total of twenty-five thousand, and about one-third of this loss is due to puerperal infection. During 1924, in the city of greater New York, there were 130,436 births reported, with 240 cases of puerperal sepsis. The deaths from the same cause were 128. One mother in every 1018 delivered lost her life from infection due to childbirth. This is still one of the unsolved problems of medicine, for, quoting DeLee,[1] one woman in every four hundred who is delivered at term, succumbs to this disease, and ten times this number are left incurable invalids.

In 1843, Oliver Wendell Holmes published a paper on *The Contagiousness of Puerperal Fever* and in 1847, Semmelweis recognized the fact that a large part of the mortality from childbirth was due to carelessness on the part of the physician or midwife. In 1848, he was able to reduce the mortality from about 10 per cent to 1.2 per cent by careful cleansing of the hands.

Following the discovery of antiseptics and a recognition of their importance in surgery, they were applied to obstetrics. During the period from 1880 to 1895, antiseptic douches were prevalent, and they were used both antepartum and postpartum.

Williams,[2, 3] in 1893 and 1898, confirmed the findings of Krönig,[4] that the vagina was sterile or contained only nonpathogenic bacteria. This theory was apparently accepted, and from that time on, little or no attention has been given to the preparation of the vagina for

*Read before the New York Obstetrical Society, March 10, 1925.

delivery, and during the same period there has been no change in the morbidity and mortality statistics. The total death rate from puerperal infection in the registration area of 1900 was 11.6 per 100,000 of the female population, and twenty years later, 1920, it was 12.2 for the same area.

Jötten,[5] in 1912, examined 100 cases and found streptococci, which were frequently hemolytic, in 67 per cent of the vaginal secretions, while Fricke,[6] working under Williams, examined 50 clinic patients and found the streptococcus on the vulva of 14 per cent, and in the vagina of 8 per cent. This work was supplemented by examining 47 patients in their homes, and in this series, the vulva contained streptococci in 75 per cent and with the Menge's tube the vaginal vault was found to contain streptococci in 55 per cent of the cases. The

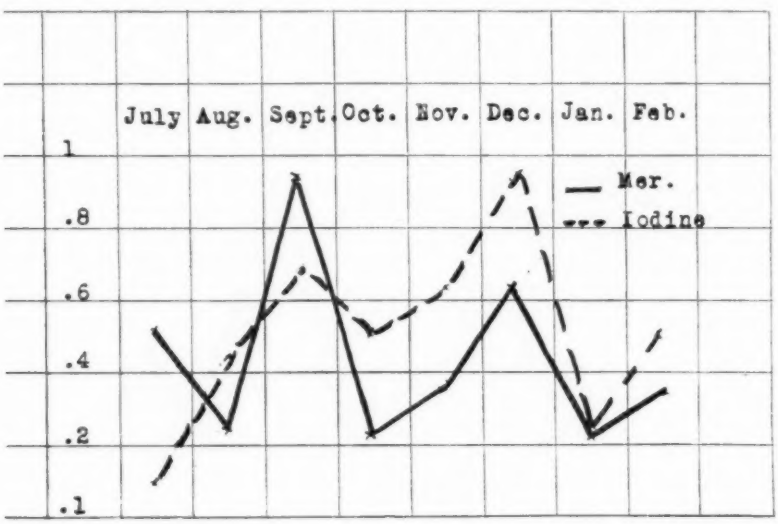

Chart 1.—Comparison of the average number of days morbidity per patient, by months.

reason given for not finding the pathogenic bacteria in the vagina in the earlier work was because improper media were used. Judging from these findings, it would seem evident that autoinfection might be possible and if some routine preparation could be found that would destroy a part or all of these pathogenic organisms there would be a reduction in our puerperal morbidity.

Johnson and Siddall,[7] in 1922, took alternate patients, one would receive the routine preparation, soap, water and so forth, the next had no preparation except clipping of the pubic hairs. The first group gave a morbidity of 16.3 per cent, and the latter a morbidity of 12.4 per cent. This seemed to show that the generally accepted preparation of today is of little value, or at least it is not what it should be.

Until three years ago (1922) our routine preparation for deliveries at the Methodist Episcopal Hospital in Brooklyn, consisted in a thorough cleansing with soap and water and then flushing with sterile water and a solution of mercury bichloride. This preparation had many objections, and we felt that infection might be carried into the vagina by the solutions. Since then we have been painting the intro-

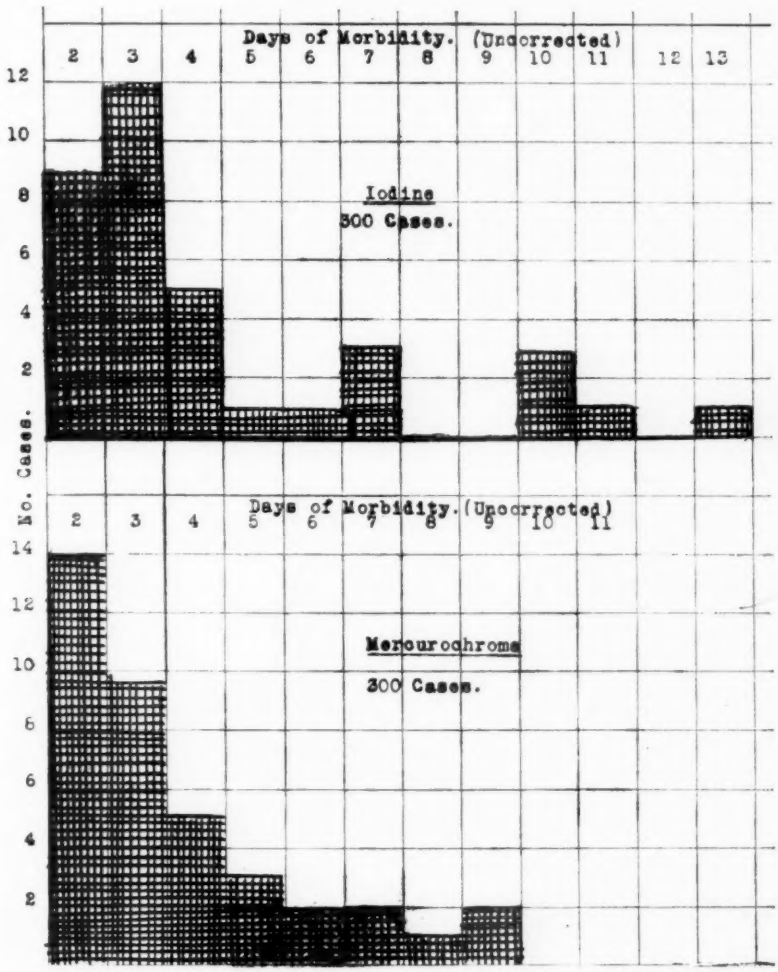
Days of Morbidity. (Uncorrected)
2 3 4 5 6 7 8 9 10 11 12 13
No. Cases.
12 10 8 6 4 2
Iodine
300 Cases.
Days of Morbidity. (Uncorrected)
2 3 4 5 6 7 8 9 10 11
No. Cases.
14 12 10 6 6 4 2
Mercurochrome
300 Cases.

Chart 2.—This chart shows that even though there was a greater percentage of morbidity with the mercurochrome, the days of morbidity were less and the majority of the patients had a morbidity for only two or three days' duration.

itus, the vulva, and the surrounding field with a 3.5 per cent tincture of iodine. This has worked satisfactorily, but the patients object strenuously to its application, unless they are under an anesthetic, and occasionally there is some blistering of the skin or mucous membrane. At that time (1922), I compared the morbidity of 188 cases in which the iodine was used with 184 in which soap, water, etc., were

used. The preparation with iodine gave a morbidity of 15.9 per cent and the preparation with soap and water a morbidity of 13 per cent. Neither of these technics is absolutely satisfactory, so we have been experimenting with a 4 per cent solution of mercurochrome, 220 soluble, chemically known as dibrom-oxymercuri-fluorescin, or its sodium salt, which contains about 26 per cent of mercury, using it exclusively in the preparation of all our cases in the second obstetrical service, which is in charge of R. M. Beach. During the first six months of its use, the vulva and adjacent area was painted immediately before delivery with mercurochrome and a dram of the solution was poured into the vagina, working it carefully into the mucous folds and around the cervix or presenting part. The results were gratifying and compared favorably with the cases in the first obstetrical (Dr. Humpstone's) service, which continued to use iodine.

We became interested in the bacteriologic side of the problem and made numerous vaginal smears from the patients, both before and after delivery, to see whether there was any difference between the two services. Having derived very little satisfaction from this study, we decided to make cultures before and after the preparation. Glucose agar was first used and the results proved that the mercurochrome had a greatly inhibitive effect on the growth of the vaginal bacteria and undoubtedly destroyed a large majority of those present. Broth seemed to be a better medium because of the fact that the small amount of mercurochrome that is carried over with the lochia is diluted many times. If cultures were taken immediately after the preparation, they were often positive; if taken five minutes after the preparation, they were usually sterile; and if taken an hour or more after the instillation of mercurochrome, they were almost always sterile. Thirty-nine cultures were made from the lochia before the preparation and all but two showed positive growths, either a staphylococcus or a streptococcus was found in the majority of the smears. Thirty-one cultures were taken an hour or more after the initial preparation and 2 showed a growth in twenty-four hours, 1 in forty-eight hours, and 1 in seventy-two hours. The bacteria recovered in all these were staphylococci.

Specimens of the lochia were treated in a test tube with 4 per cent mercurochrome and cultures made at intervals of one minute. These were nearly all sterile on agar after a period of five minutes but some growths were obtained when broth was used as a culture medium. The only pathogenic bacterium found in the broth was the staphylococcus. In no case was there a streptococcus or colon bacillus found in the culture taken after the use of mercurochrome.

These experiments proved to us that the mercurochrome had to remain in contact with the vaginal secretion for a definite period of time, and so beginning on January first, 1925, we decided to delay

delivery or instrumentation for at least five minutes after the preparation, and our morbidity for January was 6.6 per cent. Since then we have again changed our rules for the preparation of the patients and the following is our present routine:

Preparation on Admission:

1. On admission, the vulva receives a careful preparation; plenty of green soap and water are used in order to remove all oily or sebaceous material from the skin and labial folds.

2. If the patient is in labor, the external genitalia and introitus are painted thoroughly with 4 per cent mercurochrome solution; and, after elevating the hips, one dram of the same solution is instilled into the vagina. We use a large medicine dropper to which is attached a piece of catheter four inches long. The dropper is filled with mercurochrome, the labia separated, the catheter inserted into the vagina, and the solution instilled.

Preparation for Vaginal Examination, Delivery, or Induction of Labor:

1. Using an atomizer, the inner sides of the thighs, buttocks, lower abdomen, and external genitals are sprayed with a 4 per cent solution of mercurochrome.

2. With a stick sponge the vaginal outlet and anal region are painted with the same solution.

3. With two fingers inserted into the vagina, one dram of the solution is instilled and worked well into the folds of the mucous membrane, and around the cervix or presenting part.

4. If at any time the field becomes soiled by feces or otherwise, it is cleansed with saline solution and more mercurochrome is used.

5. If an hour or more elapses between vaginal examinations, or between a vaginal examination and a delivery, the preparation is repeated.

6. For induction of labor the patient should be put in the Clark position and the bag inserted after the vagina is filled with mercurochrome solution. When the bag is tied, the vagina is again filled with mercurochrome solution, and a small pack of plain gauze is inserted.

7. We feel that, when possible, at least one hour should be allowed to elapse between the time the mercurochrome is first put into the vagina and the beginning of delivery or any operative interference.

Preparation for Cesarean Operation:

1. The foot of the bed is elevated and, after carefully painting the vulva and vaginal orifice with mercurochrome, we instill one dram of the solution into the vagina.

2. In neglected or potentially infected cases that need a cesarean section, we would recommend the injection of a solution of mercurochrome into the amniotic cavity at least one hour before the operation. We have been able on repeated occasions to kill streptococcus, staphylococcus, and bacillus coli in liquor amnii, with dilutions of mercurochrome of 1 to 1000, in one hour. The technic followed was that used by Young, White, and Swartz[8] and described by them in 1919.

CLINICAL RESULTS

In order to compare the clinical results following the use of mercurochrome with those following the use of iodine in preparing a patient for delivery, I have made a study of the morbidity on the two services. Any case in which the patient's temperature remained

at or above 100.4° F. for twenty-four hours or longer, or reached 100.4° F. on two successive days during the first ten days, was considered a "morbidity." If the rise of temperature occurred on the day of delivery it was considered a reaction from labor and was not counted as a "morbidity." This is the criterion followed by Siddall,[9] and for which he gave his authority.

The total number of days of morbidity have also been counted and tabulated, for we feel that this gives a much better idea of the results obtained than when the cases with morbidity are simply enumerated.

In the first 300 cases in which mercurochrome was used, there was a morbidity of 38, or 12.6 per cent; and for the first 300 with iodine the morbidity was 35, or 11.6 per cent. The corrected morbidity for the mercurochrome was 8.3 per cent and for the iodine 10.6 per cent. The total number of days of morbidity in the former was 134, and for the iodine it was 186.

TABLE I

DELIVERIES WITH MERCUROCHROME PREPARATION

DELIVERY	CASES	MORBIDITY	PER CENT MORBIDITY	TOTAL DAYS MORBIDITY	AVERAGE DAYS PER PATIENT
Spontaneous	184	18	10.7	61	0.33
Operative	116	20	17.2	73	0.62
Induction (bag)	14	None			
Breech	15	2	13.3	4	0.26
Versions	9	3	33.3	6	0.66
Cesarean sections	7	1	14.2	2	0.26

With the mercurochrome, 13 of the patients had conditions outside of the delivery to account for the morbidity. Seven had acute respiratory infections, 3 breast complications, 1 nephritis, 1 malaria, and 1 pulmonary tuberculosis.

Out of the 25 cases of true corrected morbidity, 2 were diagnosed as a parametritis, 3 had slight infections of the perineum, while in 11 cases the rise of temperature was thought to be due to retained lochia because their fever soon subsided following the use of Fowler's position and ergot. The remaining cases had a slight rise of temperature with no physical findings or symptoms to account for their morbidity.

In the mercurochrome series, there was no pelvic or femoral phlebitis and foul lochia seldom occurred. Episiotomies, mostly lateral, invariably healed by primary union, and when there was any tenderness or irritation of the perineum, we instilled a dram of 1 per cent solution of mercurochrome into the vagina daily.

Over one-half of the patients with the mercurochrome preparation were ward cases and were delivered by eight different internes. The morbidity for the ward patients was 16.9 per cent, while the private patients gave a morbidity of 11.4 per cent. There were no deaths from any cause among the ward patients.

We feel that the comparison of the morbidity on the two services does not do justice to the mercurochrome, because for the first six months the delivery followed the preparation too closely. Nevertheless, the corrected morbidity was less for the mercurochrome and there were fifty-two days less morbidity. The small number of days of morbidity during January and February (1925) also favors the mercurochrome, for during these two months there were 100 cases delivered with mercurochrome, giving an uncorrected morbidity of 11, or 11 per cent, and a corrected morbidity of 7, or 7 per cent, 4 respiratory infections, including 1 pneumonia, which accounted for the difference in these morbidity rates. Of the corrected morbidity cases, 1 had a tonsillitis with same abdominal tenderness, with three days morbidity, 5 had lochiometra, with a morbidity of two days each, and 1 had a morbidity of five days following a traumatic breech

TABLE II

COMPARISON OF MORBIDITY BY MONTHS

MONTH	NO. OF PATIENTS		MORBIDITY		PER CENT MORBIDITY		DAYS OF MORBIDITY		AVERAGE DAYS OF MORBIDITY PER PATIENT	
1924	M.	I.	M.	I.	M.	I.	M.	I.	M.	I.
July	48	54	9	2	18.7	3.5	25	6	.55	.1
Aug.	66	64	4	6	5	9.3	18	30	.25	.46
Sept.	39	48	7	8	17.9	16.6	35	31	.94	.66
Oct.	48	56	4	5	8.3	8.9	13	27	.25	.48
Nov.	32	59	3	9	9.4	15.4	12	36	.37	.61
Dec.	35	39	7	7	20	17.9	29	35	.64	.95
1925										
Jan.	46	40	3	4	6.6	10	10	10	.21	.25
Feb.	54	50	8	4	14.8	4	20	26	.35	.5
	368	410	45	45	12.2	10.8	162	201	.44	.49

NOTE: The morbidity from cesarean section was not included until January 1 when we began to instill the mercurochrome into the vagina before operation.

During February, twenty-six of the patients in the iodine series were delivered after being prepared with mercurochrome.

extraction. This gives a corrected morbidity of eighteen days for the 100 deliveries or an average of 0.18 of a day for each patient.

Induction of Labor.—There were 14 bag inductions in which mercurochrome was used, with no morbidity. Six of these were for toxemia, 3 for placentia previa, 1 for pyelitis, 1 for transverse position, 1 for tuberculosis, and 3 were overdue. The morbidity of 20 bag inductions done before we started the use of mercurochrome was 6, or 30 per cent, and 1 of these died from postpartum infection.

Versions and Breech Deliveries.—Nine patients were delivered by version, 3 of which had a morbidity of two days each, and in 15 breech deliveries, several of which had intrauterine manipulation, 2 had a morbidity of two days each.

Cesarean Section.—Mercurochrome was used in the vagina in 7 cases, with a morbidity of 1, or 14.2 per cent. This patient had a morbidity

of two days, not due to infection, and died from an intestinal paresis and cardiac dilatation.

There was 1 death from sepsis on each service. One patient who had mercurochrome was admitted with a tonsillitis; a streptococcus was obtained from her throat and later from the blood stream. The other case was very toxic, markedly edematous, and delivered following a bag induction. A streptococcus was recovered from her blood.

There was not a single case of chronic sepsis in the 368 cases delivered with mercurochrome, and we feel justified in making the statement that the health of none of these patients has been impaired by infection.

The patient that remained in the hospital the longest period after being delivered with mercurochrome was there for twenty-nine days, and the first and the last nine days of her stay in the hospital were without morbidity.

The excellent results obtained in the operative cases influenced us in changing our method of preparation so that the mercurochrome had a longer time to act on the vagina and its secretions.

TABLE III

MORBIDITY AT M. E. HOSPITAL

	TECHNIC	CASES	PER. CENT MORBIDITY	DEATHS FROM SEPSIS
Dec., Jan., and Feb., 1921-22	Soap & water	188	13	1
Dec., Jan., and Feb., 1922-23	Iodine	184	15.9	0
Dec., Jan., and Feb., 1923-24	Iodine	211	16.1	2
Dec., Jan., and Feb., 1924-25	Iodine	129	11.6	1
Dec., Jan., and Feb., 1924-25	Mercurochrome	135	13.3	1

The average number of days of morbidity per patient for the months quoted above, with iodine, for 1923-24 was 0.69 and for the mercurochrome, 1924-25, was 0.44.

We believe that mercurochrome is preferable to iodine in vaginal preparations because:

1. It can be applied without an anesthetic, is painless, and there is no danger of irritation or blistering of the skin or mucous membrane of the vagina or rectum.

2. Repeated applications can be made during labor and delivery.

3. It is apparently harmless to the baby.

4. It can be used in large amounts.

5. It is not incompatible with bichloride of mercury, which is often used by the nurses during catheterization.

6. The skin and mucous membrane, although stained, are still soft and pliable.

7. It does not coagulate protein, and can be applied to lacerated tissue without injuring the exposed structures.

CONCLUSIONS

1. We believe that an attempt should be made to sterilize the birth canal before every delivery.

2. We believe that an antiseptic in the vagina during labor reduces the chances of infection during that period.

3. A 4 per cent solution of mercurochrome offers a valuable, non-irritating solution which apparently will answer this purpose.

4. A preliminary study of its use over a period of eight months shows fewer days of morbidity than when iodine is used.

5. Mercurochrome is particularly adapted for induction of labor and for all operative deliveries.

6. The accoucheur has a feeling of security while using mercurochrome which he does not have while using the old method of preparation.

7. The stain of mercurochrome on linen and the hands of the operator is its only objection, but in actual practice this is almost negligible.

8. We are anticipating its intrauterine use before cesarean section in neglected cases with ruptured membranes.

9. We believe that by following our technic closely the mortality and morbidity from puerperal sepsis will be reduced to a minimum.

NOTE: During the last three months the mercurochrome technic, as described above, has been used on 144 more patients with an uncorrected morbidity of 7 or 4.8 per cent, and a corrected morbidity of 5 or 3.4 per cent. The days of morbidity for the former were 43 or .29 per cent of a day per patient and for the latter 28 days of morbidity or .19 per cent of a day per patient. The cause of the morbidity was as follows; 1 colitis, 1 breast condition, 1 parametritis, 1 parametritis with pulmonary tuberculosis, and three lochiometra. Three of the deliveries giving morbidity were spontaneous, two were low forceps, one induction and one cesarean. In two of the cases the preparation was done less than an hour before delivery.

During the same period 142 patients were delivered with the iodine preparation with an uncorrected morbidity of 23 or 16.1 per cent and a total of 122 days morbidity or .81 per cent of a day per patient.

REFERENCES

[1]DeLee, J. B.: Principles and Practice of Obstetrics, Philadelphia, ed. 3, 1918, W. B. Saunders Co., p. 897.
[2]Williams, J. W.: Am. Jour. Med. Sc., July, 1893, cvi, 45-58.
[3]Williams, J. W.: Am. Jour. Obst., 1898, xxxviii, 807-818.
[4]Krönig: Quoted from Williams' Textbook of Obstetrics, ed. 5, p. 996.
[5]Jötten: Zentralbl. f. Gynäk., 1912, pp. 1529-1533.
[6]Fricke: Quoted from Williams' Textbook of Obstetrics, ed. 5, p. 997.
[7]Johnson and Siddall: AM. JOUR. OBST. AND GYNEC., 1922, 645-650.
[8]Young, White, and Swartz: Jour. Am. Med. Assn., Nov. 15, 1919, lxxiii, 1483-1491.
[9]Siddall, R. S.: Surg., Gynec. and Obst., 1925, xl, 282.

494 FIRST STREET.

(*For discussion see page* 137.)

FOUR YEARS EXPERIENCE WITH RADIUM IN THE TREATMENT OF GYNECOLOGIC CONDITIONS*

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MODERN medicine, notwithstanding all methods of treatment, is still the proud possessor of a legacy of 60 per cent mortality in cancer of the cervix. Unfortunately, the majority of such cases referred to me have been inoperable, advanced or hopelessly beyond aid. Apropos of this, it has been stated frequently in discussions on the cancer problem that the reason for the delay in beginning treatment of cancer is to be laid to the family physician, who has not recognized it early enough, and the literature sent out to the laity by the American Society for the Prevention of Cancer insinuates as much. My observation is that this is far from the truth. Practically all patients who have been referred to me have been sent immediately after reporting to their attending physicians. If I may be permitted to express my opinion upon this phase of the subject at this point, it is this: In the propaganda by the American Society for the Prevention of Cancer the advice is given to women to consult a doctor at once upon the appearance of any irregular vaginal bleeding, especially around the menopause. From the study of my cases during the past four years I am thoroughly convinced that when cancer of the cervix begins to bleed the disease is already well advanced, and I am doubtful whether the dissemination of such information has been productive of any material diminution in the spread of cancer of the cervix. It is my conviction that to obtain appreciable results, women who have borne children should have careful gynecologic examination at stated intervals from the late thirties onward, just as they have stated dental examinations. It is quite obvious that women apparently in good health will resent this suggestion, but until they are educated to the importance of such a measure, I am of the opinion that not much will be accomplished in checking this dreaded scourge, which is ever on the increase. Early diagnosis is the goal to which we are all striving, but it is a glaring fact that we are woefully lacking in this respect, largely because women have a natural abhorrence of vaginal examinations while in apparently good health. It should be quite evident that in this suggestion lies the key to the solution of the problem of early diagnosis.

This point cannot be too strongly stressed, especially as I am doubtful in so far as cancer of the cervix is concerned, that the information imparted to the public during recent years has resulted in any

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reduction in the mortality. On the other hand, it must be admitted that it has undoubtedly resulted in a pronounced state of cancerophobia.

I have classified my cases as: 1. Operable; 2. Favorable or borderline; 3. Advanced; 4. Hopeless.

This classification does not conform to that offered by the Committee of Malignant Diseases appointed by the American College of Surgeons, whose report was published in July, 1924, yet it is based upon that report. Because that classification is more or less intricate and takes into consideration details that have not confronted me, I have adopted this simpler and for me far more satisfactory segregation of my cases.

Operable.—All observers admit that the definition of operability is difficult and that standardization is impossible because of the personal equation of the operator. This is demonstrated by Clark and Block[1] in their analysis of the statistics of ten large clinics in this country and Europe, in which they show an operability ranging from 15 per cent in one to 65 per cent in another. However, by the general acceptance of the term "operable" is meant, that relatively rare case, in which there is only a small eroded area on the cervix, without extension to the vaginal wall, without infiltration into the broad ligaments, and with a freely movable uterus. It is noteworthy that there was only one case in my small series, representing about 3 per cent, which I felt met these specifications, and which is probably not far from the correct average seen in practice. This patient is apparently free from disease three and one-half years after operation. The above-mentioned authors collected from the ten clinics 1539 operations with 39 per cent of five-year cures. In comparison with that they give 34 per cent of five year cures with radium alone in their clinic at the University of Pennsylvania Hospital, their series comprising inoperable as well as operable cases. They judge from the voluminous literature that about 43 per cent of five-year cures are obtained from radium in early favorable cases, though they do not vouch for the authenticity of such statement. It is a noticeable fact that since the advent of radium the limits of operability have been greatly narrowed and many cases previously subjected to hysterectomy are now referred for irradiation. Therefore, because of the more or less universal narrowing of the limits of operability, the future should witness much better results from surgery in conjunction with radium in the cases selected for operation. However, emphasis must be placed upon the observation that the early operable case is a clinical rarity. Naturally this should be borne in mind when comparing the end-results of surgery with those obtained by radium, which is applied to a far broader field.

Favorable or Borderline Cases.—If the definition of operability is such a mutable problem, there is even greater divergence of opinion as to the mode of attack on the borderline case. Authorities, notably John G. Clark[1] and George Gray Ward,[2] hold that irradiation alone is the method of choice. Others, among whom is W. P. Graves,[3] consider operation might be justifiable, but if so, it should be followed by irradiation. There is another group, represented by the Mayo Clinic,[4] Howard C. Taylor,[5] Bailey and Healy,[6] and others, whose routine is to irradiate, perform hysterectomy about three weeks later, and again irradiate shortly following operation. I am not prepared, however, to compare the relative values of the three different methods of procedure, because I have been unable, in my search of the literature, to find reports of the end-results of the respective methods that are sufficiently definite to permit me to draw any conclusion. Of course, my cases are too few to shed any light of value upon the subject, but it does seem that fairly good results have been obtained by hysterectomy in conjunction with irradiation, though I have no cures to report. Possibly in the clinics where large quantities of radium are available, irradiation alone should be the choice of treatment, but when a borderline case comes to one, such as myself, possessing only a relatively small amount of radium, hysterectomy with irradiation both pre- and postoperatively might be justifiable. While such a procedure is countenanced by so renowned a clinic as the Mayo's, I feel sufficiently warranted in continuing the practice (for the time being at least) until there is more unanimity among the leading gynecologists to dissuade me. With the larger dosage that I am now using, I hope in the future to obtain even more benefit than I can now show in these few cases.

The cases that are placed in this category are those in which the disease has apparently not made deep inroads, and in which the operator feels that he has a *reasonable* chance to eradicate the growth. It is not an uncommon experience, however, for one to operate thinking he has such a favorable case, but much to his dismay, it is soon found that there is widespread extension into the broad ligaments far beyond the reach of the scalpel. This was my lot two years ago, when, thinking I had an early borderline case, I did a hysterectomy on a woman two weeks after the onset of bleeding, and apparently with only a small ulcerated area on the cervix, but with actually deep infiltration of the process into the broad ligaments.

It is needless, and unpleasant, to say that the average operator does not possess the competence or possibly the courage to perform such radical hysterectomies as form the basis of the estimation of the 39 per cent of five-year cures by surgery as above mentioned. These statistics are from the clinics of master surgeons, and this also should

be borne in mind in the consideration of the comparative values of surgery and radium.

The Advanced Cases.—Here I have placed the cases with well-pronounced local disease, large cauliflower cervix, with extension into the vaginal vault and some induration in the fornices, but in which the general health of the patient has not yet become materially affected. In these, invariably, there has been shown a pronounced temporary improvement and palliation. Locally the ulceration of the mucous membrane has become smooth, the foul odorous discharge has disappeared and the bleeding checked, and for a few months the general health of the patient has usually noticeably improved. Undoubtedly here, radium has been a most beneficial agent, because all of these cases were definitely beyond the pale of surgery, and no other means were at hand offering any hope of alleviation. Even if it be proved eventually that radium has no other real value in cancer, its temporary relief afforded to this class of cases would seem to be sufficient justification for its use. However, after several months it has become quite evident that the efforts at devastation of the formidable disease have been futile, and we realized that our hopes had been blasted. Possibly larger dosage might have stemmed the tide a while longer.

The Hopeless Cases.—All of these have been ward cases either at Providence or Gallinger Hospitals, some even being on the brink of the grave, but I have not refused treatment of any of them, thinking some palliation might be given. Little, if any benefit has been afforded, and it may be that possibly the end was somewhat hastened in some instances. Frequently, by lessening the odorous discharge and checking the bleeding, the radium has been a palliative measure of value.

It is questionable whether it is wise to irradiate the really hopeless cases that are cachectic, for frequently they are apparently made worse by the treatment. The probable explanation for the rapid regression in such cases is not so much that the growth is stimulated, but rather that the lowered resistance and vitality of the individual, upon which so much depends, is accentuated. In some clinics the practice of treating these very hopeless cases has been abandoned. It is well to emphasize that radium seldom alleviates pain, and as has been frequently pointed out, cancer in its terminal stages is always painful, regardless of whatever treatment has been instituted.

As to the technic: Here again there is no standardization, for the amounts applied vary from 50 mg. of the element to gram doses of the emanation. Quite naturally one would expect varying results. Formerly, I applied 50 mg. for fourteen hours three times at forty-eight hour intervals with a total of 2100 mg. hours, while now I am applying 50 mg. for twenty-four hours, four or five times at forty-eight

hour intervals with a total of 4800 or 6000 mg. hours, using as my model, but with deviations, the technic in vogue at the Mayo Clinic.

All cases in the series were definitely diagnosed by microscopic examination, and all have been traced up to December, 1924. There were other cases treated which are not considered here because pathologic examinations were not made, or else they could not be traced to ascertain the end-results.

All of the cervical cases treated have been of the squamous cell variety except four, which were adenocarcinoma. I am aware that some authorities, notably Martzloff,[7] Broders,[8] and others, state that they can prognosticate the course of the disease by the type of the cell, but I have had to be content to receive a report as to the distribution of the cells, and whether or not they seemed to be rapidly proliferating.

Among my cases there was one of adenocarcinoma of the body of the uterus. Because she was seventy years of age and a poor operative risk, she was treated with radium in July, 1921. In May, 1923, her physician reported that all symptoms had been relieved, and that her general condition was good. While on a visit to Florida, late in 1923, she died from pneumonia.

I will not dwell upon cancer of the body of the uterus because it has been generally agreed that it is preeminently a surgical condition except in the face of well recognized contraindications. It has frequently been stated that hysterectomy has produced cures as high as 80 per cent. However, Norris and Vogt[9] throw some doubt upon this, feeling that such percentages are fallacious, because in reviewing 57 cases, they were only able to obtain 37 per cent of three-year cures following operation, while in 20 cases they obtained 45 per cent of three-year cures by irradiation.

Also in the series there was one case of sarcoma of the cervix; whether or not it was primary in the cervix I am unable to say. This patient was hopelessly beyond any help and succumbed ten days after the radium application.

In the series I encountered cancer of the cervix in three women who had previously had a subtotal hysterectomy, which of course may be an argument against this operation.

Two patients had intestinal obstruction, one twenty-two months, and the other six months after the radium treatments. Just how much of a factor irradiation was in the production of the obstruction I am not prepared to say.

One patient had a rectovaginal fistula; another had a vesicovaginal fistula; and another had a rectovaginal together with a vesicovaginal fistula, several months after irradiation. However, fistulae are not more common in the irradiated cases than in those which receive no treatment.

My youngest patient was aged twenty-five years, who consulted me within two weeks after the appearance of the initial symptoms, and three weeks after a normal period. She was given a course of treatment immediately, and a second course two months later. Two days after the last treatment she passed a fetus between three and four months gestation. I was not aware that she was pregnant. The course of the disease in this case progressed very rapidly, probably the most rapid in the series.

TABLE I

CANCER OF CERVIX

Group I. Early Operable

CASE NO.	OPERATION	RADIUM	RESULT	REMARKS
35	May, 1921. By R. Y. Sullivan	2100 mg. hr. before operation 2100 mg. hr. after operation	Patient apparently in good health at present. No evidence of recurrence	
		Group II. Borderline Cases		
193	March, 1923. Adenocarcinoma	3000 mg. hr. before operation 3000 mg. hr. after operation	Jan., 1925, no evidence of recurrence. 22 mo. later. Gen. health good. Has a vesicovaginal fistula	
10	Nov., 1920.	For recurrence: 21000 mg. hr., Feb., 1921 2400 mg. hr., Nov., 1921	Died Dec., 1922, obstruction of bowel	Lived 25 months
94	June, 1920	For recurrence: Hopeless 2100 mg. hr., 1/21 2300 mg. hr., 5/21	Died Oct., 1921. Rectovag. fistula Vesicovag. fistula	Probably not a borderline case
118	Feb., 1922	2900 mg. hr. after operation	Died Aug., 1924	Lived 2½ years
225	March, 1920	3600 mg. hr. Feb., 1923	Living, in fair condition. Evidence of recurrence	
231	April, 1923. Incomplete supravaginal hysterectomy	3600 mg. hr., May, 1923 3600 mg. hr., Nov., 1924	Condition fair, though there is a mass in pelvis	
263	Dec., 1920. Panhysterectomy. Oct., 1922, attempt to repair rectovaginal fistula	3000 mg. hr., 7/23 Recurrence hopeless	Died Oct., 1923	
380	Sept., 1923 Panhysterectomy	2100 mg. hr., April, 1924	Disease is progressing	

Of the eight cases in Group II, I can personally answer only for the first one, Case No. 193, as to whether there existed a reasonable chance to eradicate the disease by operation. I felt that there was,

but as a matter of fact there was no such chance, as was found upon opening the abdomen. Yet with radium pre- and postoperatively this patient seems to be free from recurrence practically two years later, even though she is suffering with a vesicovaginal fistula.

All of the other cases were operated upon by other surgeons and referred for irradiation for recurrences months later. It is assumed that these surgeons felt that they had a reasonable chance to cure their patients, but what their conceptions of operability are, I am not prepared to state. In none of the cases was a radical Wertheim performed, and in one case an incomplete supravaginal hysterectomy was done, yet in all cases fair results were obtained, one patient being alive almost five years since the operation.

Had radium been used in these cases preceding and immediately following the operation, I am optimistic enough to believe that far better results could be shown.

Group III. Advanced Cases but General Health not Greatly Affected

CASE NO.	RADIUM	CONDITION
370	March, 1923, amount? April, 1924, 3600 mg. hr.	Condition good. 22 mo. since treatment
409	May, 1924, 3600 mg. hr.	Disease progressing. 8 mo. since treatment
410	July, 1924, 3600 mg. hr.	Condition good. 6 mo. since treatment
12	March, 1921, 2100 mg. hr. January, 1922, 2700 mg. hr.	Died. June, 1922. Lived 15 months
92	December, 1921, 3000 mg. hr.	Died. Oct., 1923. Lived 22 months
230	May, 1923, 3600 mg. hr.	Died, August, 1924. 15 months later
444 Age 25	December, 1920, 2150 mg. hr. February, 1921, 2100 mg. hr.	Died, Sept. 21, 1921. 9 months after treatment

Group IV. Hopeless Cases

Twenty cases, all of which died from one month to two years following treatment, average duration of life following treatment in these cases being eleven months.

FIBROIDS

A perusal of the foregoing data may give the impression that in the results obtained we may not have grounds to be proudly boastful. In the next group of cases, however, the results are more stimulating.

An ever increasing literature testifies to the efficacy of radium in uterine fibroids. However, in the selection of cases for treatment, there are certain well-established fundamental principles laid down, and the failure to recognize these might possibly result in dire consequences. Only a small percentage of fibroids are suitable for irradiation and they must be carefully selected. The proper selection of cases is dependent upon diagnostic acumen. I wish to call attention to the significant fact that in my series I have only nine cases treated

by radium, whereas, during the course of the same period of time I have performed hysterectomy for fibroids forty-three times, a proportion of about one to five, thus laying claim for a certain amount of conservatism.

The following is a description of a suitable case: The patient at or near menopause, free from pain; the tumor not larger than a four months' pregnancy, freely movable, with no palpable masses in the adnexa, and menorrhagia being practically the only symptom, aside from the usually accompanying anemia. Any given case not meeting these specifications naturally is not a suitable one, and there is reason to believe that my proportion is not far from the correct average seen in even a larger practice.

The contraindications to irradiation of fibroids generally mentioned are:

1.—Tumors of large size, or a tumor on a pedicle. In these, surgery is the method of choice because in the large or pedunculated tumors irradiation does not always produce material reduction in size. Also the tumor on a pedicle is not likely to be affected because it is frequently too far distant from the rays. Another argument in favor of operation in the large tumors is that only too often are they associated with dense intestinal and omental adhesions, and also with large ovarian cysts and hydrosalpingitis, which conditions, needless to say, are only amenable to surgery. The relief afforded in the smaller tumors by irradiation is seen in the lessening or the complete checking of the hemorrhage, the predominating symptom.

2.—Young women should have the benefit of surgery because a myomectomy may be done, thus conserving the uterus for future childbearing. On the other hand, should the tumor be such as would not permit of myomectomy and hysterectomy is the only alternative then, if the case in other respects meets the specifications above noted, irradiation may be considered. Even then it may be argued that it is far better to remove the uterus, leaving healthy ovaries unimpaired. Under such circumstances the ovaries are conserved for the benefit of ovulation and their internal secretion for a few years at least, whereas if radium be used in sufficient dosage to influence the tumor, more than likely the ovaries will be permanently damaged. On the whole, in young women surgery should have the first consideration.

3.—Patients who give a history of previous pelvic infection, or in whom by vaginal examination there is found evidence of adnexal disease, such as induration or thickening, should not be irradiated. Radium is prone to light up such old inflammatory processes, producing serious consequences, possibly peritonitis, and indeed in some instances reported, death has resulted.

4.—Clark and Keene[10] have pointed out that radium is particularly contraindicated in women who present a picture of marked anemia or

cachexia out of proportion to the amount of blood lost, because he has observed in such instances the presence of some constitutional disease, or else it is evidence of degeneration of the tumor. Degenerating submucous fibroids are not favorable cases for irradiation, and this brings us to the contemplation of probably the most serious objection offered to the use of radium in the treatment of fibroids. To say that one is not dealing with a degenerating fibroid is a difficulty that cannot be denied. Degeneration is not quite so likely to be met in the smaller tumors. If it is present, the character of the bleeding and systemic symptoms may offer a clue to its existence. Suffice it to say that such a combination of symptoms should be reason for more thorough study of the case, and again we must stress the importance of diagnostic acumen in the proper selection of cases for treatment.

Sarcomatous degeneration and the development of carcinoma in fibroids have been offered as possible objections to irradiation, but such objection hardly holds because the occurrence of the former is not more than 1 or 2 per cent, and the latter not much greater. In any event, should such a complication be existent but unrecognized, irradiation would not be inappropriate treatment.

As to the action of radium there is not unanimity of opinion. One school maintains that the results are produced by the effect on the graaffian follicle, the controlling center of menstrual bleeding, which is claimed to be one of the most vulnerable points in the body to the action of radium. Another school holds that the action is primarily upon the endometrium and the uterine musculature, producing a sclerosis of the blood vessels with possibly direct injury to the muscle cells. It may be that both views are in part correct, and that its action is by a combination of these processes.

The technic consists in dilatation of the cervix under gas anesthesia and the intrauterine application of 50 mg. of radium for twenty-four hours. The patient is confined in the hospital for only a few days, and her stay is always pleasant, not being marred by such disagreeable occurrences as always, or usually, follow abdominal operations. In some instances a repetition of the procedure may be required in the course of a year or so, but a symptomatic cure will result in a vast majority of cases. In my few cases I am able to report 100 per cent symptomatic cures, though in not all of the cases have the tumors disappeared.

Ewing[11] warns of the danger of curettage preceding the intrauterine application of radium, stating that in the few cases in which he has encountered untoward results, the damage was attributable, in his opinion, to the too vigorous curetting.

The advantages over hysterectomy are self-evident: The shortened hospitalization with its attendant expense, and the absence of mortality and morbidity. The latter following hysterectomy ofttimes

proves very distressing, though mortality from hysterectomy for uncomplicated fibroids should be almost negligible. Many eminent surgeons have reported series with less than 1 or 2 per cent of deaths following hysterectomy, but it must be remembered that the rank and file of us are not master surgeons, and I dare say that the mortality in the hands of such is greater. It is also probably true that many more hysterectomies are performed by the rank and file than are done by master surgeons.

Having determined that a given case is suitable for irradiation, I endeavor to elucidate the advantages and disadvantages of the modes of treatment, fairly and squarely. The patient is told that an operation is a sure and permanent cure, but she is permitted to make the choice of procedure.

TABLE II
FIBROIDS

CASE NO.	SYMPTOMS	RADIUM	RESULT
46	Age 41. Tumor size 4 mo. pregnancy. Flooding; hemoglobin 45. General condition poor. Excessive flow for 1 year	June, 1921, 1200 mg. hr.	Dec., 1924. Irregular bleeding. Hemogl. 75% 60 days later.
		Aug., 1923, 1200 mg. hr.	Irregular flow at times; tumor reduced 50%. General condition excellent
62	Age 54. Tumor size 2 mo. pregnancy. Hemorrhages for two yr. Hemogl. 60	Aug., 1921, 1200 mg. hr.	No flow since. Uterus about normal size; hard
179	Age 46. Small tumor in post. wall of uterus. Uterus soft; hemogl. 65. General condition poor	Oct., 1922, 1200 mg. hr.	No bleeding since. Uterus normal size. General condition excellent
262	Age 29. Tumor size 6 wk. pregnancy. For 2 yr. periods excessive every 2 wk. Hemoglobin 226. Red cells 2,600,000	July, 1923, 1200 mg. hr.	Sept., 1923, much improved; hemoglobin 50. Last report Jan., 1924. No bleeding since treatment. General condition good
314	Age 49. Tumor size 4 mo. pregnancy. Excessive flow for 7 yr. General health poor; had an exhaustion psychosis	Dec., 1923, 1200 mg. hr.	Tumor not materially reduced in size. Slight menstrual flow 4 times in 1924. Mental condition clear; general health good
342	Age 45. Tumor size 3 mo. pregnancy. Excessive flow for 6 mo. Very weak and anemic	March, 1924, 1200 mg. hr.	Uterus only slightly larger than normal. No bleeding since treatment
381	Age 39. Tumor size 2 mo. pregnancy. Excessive flow every 2 wk. for 1 yr.	April, 1924, 1200 mg. hr.	No bleeding since treatment. Uterus only slightly larger than normal. General condition good
404	Age 46. Tumor size 3 mo. pregnancy. Excessive flow for 3 months	June, 1924, 1200 mg. hr.	No bleeding since treatment. General condition good

BLEEDING CASES

There is a third group of cases, those in which there is excessive bleeding at the menopause, without demonstrable gross pathology, and

in which radium is the treatment *par excellence,* indeed a specific. In no branch of medicine is there a drug or a method of treatment which produces such uniformly gratifying results. I have fifteen cases in this group, and I can assure you as a result I have fifteen most grateful patients.

We are ever encountering women at or near the menopause complaining of profuse and prolonged menstrual flow, in whom examination reveals no marked abnormality or possibly only a slightly enlarged uterus, and until the advent of radium all sorts of treatment were frequently of no avail. This condition has been variously ascribed to endometritis, metritis, fibrosis, arteriosclerosis of the uterine vessels, hyperplasia, etc. Possibly a more fitting term is pathologic bleeding in the grossly normal uterus.

There is some authority for the claim that the condition is due to an abnormality of the endometrium or of the uterine musculature, but it seems that the more plausible explanation is that it is attributable to ovarian dysfunction. As far back as 1908, Hitschmann and Adler[12] demonstrated hyperplasia, fibrosis, etc., in just as many nonbleeding uteri as in the bleeding ones, and Novak's[13] recent work seems to substantiate this. Also in many of the bleeding cases, microscopic examination of the uterine scrapings has failed to reveal any abnormality, which would seem to lend credence to the latter view. The corpus luteum or the graaffian follicle is the governing center of normal menstruation, hence it may be reasonable to assume that they are chiefly concerned in the production of this abnormal flow. What was said in reference to the action of radium in fibroids holds equally true in its action in these cases; that is, it no doubt affects both the uterus and the ovary.

Fifty milligrams of radium inserted into the uterine cavity for twenty-four hours (1200 milligram hours) almost invariably produces a cessation of the bleeding, though occasionally a second application may be required several months later.

While it may be unnecessary to curette the fibroids preceding the application of radium, it should be an invariable rule in these cases, in order to rule out carcinoma of the body. However, Ewing offers strenuous objection to such practice because he says cancer cells may be found in smears made of the discharge, or else its presence can be demonstrated by Clark's simple test, which is the introduction of a sound into the uterine cavity, and if body cancer exists, the removal of the sound will be followed by bleeding. While these two tests may be reliable, yet if curettage be performed with due care, little, if any, harm should accrue, but valuable information is gained.

In only one case in my series was there any untoward result. In this case phlegmasia alba dolens developed, which was a disturbing factor for several months. It is possible that this complication may

TABLE III

BLEEDING CASES

CASE NO.	AGE	SYMPTOMS	RADIUM	RESULT	REMARKS
28	40	Heavy flow for 3 yr. Curetted twice, with little, if any, improvement	1200 mg. hr. 1/20/21	No flow since	
83	36	Heavy flow for 3 yr. Curettage Sept., 1918, curettage Feb., 1919, no improvement	1000 mg. hr. Nov., 1921	No flow since. Good health	
85	39	Heavy flow for several months Curetted Apr. 1, 1921; no relief. Excessive flow continuously for last 6 weeks	600 mg. hr.	Occasionally has slight flow for 3 or 4 days	
107	45	Heavy flow. Flooding for past 2 weeks	1200 mg. hr. 2/2/22	No flow since. Health good	
132	46	Excessive flow	1200 mg. hr. 5/4/22	No flow since	
161	29	Excessive flow for 2 yr. Curettage in 1920	600 mg. hr. Sept., 1922	No flow since	300 mg. hr. would have been better
180	38	Excessive flow 5 or 6 yr. Curettage, 1917; x-rays Oct., 1917, amenorrhea to Jan., 1918. In bed 4 mo. Confinement in 1919. Heavy continuous flow for past 5 months. Hemoglobin 53	600 mg. hr. Nov., 1922	Periods more normal than for past 4 yr. General health good	Did not want to be sterilized
261	54	Excessive flow for 3 or 4 yr.	1200 mg. hr. 6/7/23	No flow since	
277	38	For 2 yr. periods lasting 8-10 days, heavy flow	1200 mg. hr. 9/24/23 Radium again 9/8/24 1200 mg. hr.	Some irregular bleeding No flow since	
330	48	Heavy flow, flooding, at times for 5 wk. Hemoglobin 30; transfusion 12/24/23	1200 mg. hr. 12/24/23	No flow since. Excellent health	
332	45	Excessive flow for 1 year	1200 mg. hr. Jan, 1924	Menstruated in Feb., 1924. None since. Health good	
346	39	For 5 mo. periods every 2 wk. lasting 7-8 days	600 mg. hr. 3/20/24	Periods 3-4 days monthly	
360	49	Has not been free from bleeding for 11 mo., flooding at times. Electrical treatments; no improvement	1200 mg. hr. 3/28/24	No flow since	
361	40	Heavy flow for 2 yr. Curettage Jan., 1923	1200 mg. hr. Oct., 1923	No flow since	Phlebitis for several months
359	41	For 5 yr. periods every 3 wk., heavy flow. For past 4 mo. q. 2 wks. lasting 10 days; flooding at times	1200 mg hr. 3/24/24	No flow since	
414	47	Heavy flow every 3 wk. for 2 yr. Hemogl. 51	1200 mg. hr. 8/12/24	No flow since	

be laid to the curettage, and may offer justification for Ewing's and Bovee's[14] castigation of the curette.

Likewise in these cases as in the fibroids, diligence should be exercised in eliminating the danger of lighting up of old inflammatory processes.

Not infrequently menorrhagia is a very troublesome symptom in younger women with no demonstrable gross pathology, and it is the practice of some radiologists to administer radium in smaller dosage; 300 to 600 mg. hours with good results in reducing the flow to normal limits. However, this should be done with reluctance, for one can never be prepared to say that, even in small dosage, radium will not result in a permanent cessation of menstruation. This phase should always be made clear to the patient before instituting treatment. Such was my unfortunate experience in one woman aged twenty-nine years to whom I administered 600 mg. hours in September, 1922, and she has not menstruated since. Another patient, though, aged thirty-eight years, who was anxious not to be sterilized, had the same dosage in November, 1922, and her periods have subsequently been more normal than for the preceding three years. Younger women whom it becomes necessary to irradiate should be rather underirradiated with the possibility of repetition than to undergo the danger of artificial menopause.

In conclusion, it may be stated that the consensus of opinion of innumerable conservative gynecologists who have been using radium is as follows:

1. The very early case of cancer of the cervix comes under the realm of surgery, but such a case is a rarity.

2. The proper handling of the so-called borderline cases is still in dispute.

3. Radium is a palliative agent of distinct value in the inoperable cases, under which group fall, unfortunately, the vast majority of cervical cancers seen in practice.

4. In certain selected cases of uterine fibroids radium produces satisfactory symptomatic cures.

5. In the cases of excessive menstrual flow at or near menopause, in which no gross pathology is demonstrable, radium is a specific.

My four years' experience with a limited number of cases would seem to permit me to subscribe to the foregoing statements, and further, I have not come before you as an enthusiast, but rather have I endeavored to present unadulterated facts from which I think I have drawn reasonable conclusions regarding this valuable adjunct to surgery.

REFERENCES

[1]Am. Jour. Obst. and Gynec., May, 1924, vii, 543-550.
[2]Personal communication.
[3]Boston Med. and Surg. Jour., 1923, clxxxviii, 1006.

[4]Pediology, December, 1923.
[5]Am. Jour. Obst. and Gynec., 1924, viii, 288.
[6]Radium Report of the Memorial Hospital, N. Y., 1923.
[7]Bull. Johns Hopkins Hosp., May, 1923, xxxiv, 184-195; June, 1923, xxxiv, 141-149.
[8]Jour. Am. Med. Assn., 1920, lxxiv, 656.
[9]Am. Jour. Obst. and Gynec., May, 1924, vii, 550.
[10]Trans. Am. Gynec. Soc., 1917, xlii, 424.
[11]Tr. College Phys., Phila., 1922.
[12]Monatschr. f. Geburtsh. u. Gynäk., 1908, xxvii.
[13]Jour. Am. Med. Assn., 1924, lxxxiii, 900.
[14]Surg., Gynec. and Obst., 1920, xxx, 618.

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THE SIGNIFICANCE OF THE PASSAGE OF MECONIUM DURING LABOR

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THE passage of meconium into the amniotic sac by the fetus before delivery is quite generally considered an abnormal phenomenon. But opinion is still divided over the mechanism and significance of this phenomenon since some authorities feel that it is a definite sign of fetal asphyxia, of grave prognostic omen and an indication for immediate interference, whereas others feel that it borders on the physiologic. In breech presentations, of course, it is of no significance, since here it is due merely to mechanical pressure on the abdomen. The observation that many babies hurriedly delivered because of the appearance of meconium in the amniotic fluid showed no sign whatever of asphyxia aroused our interest in this subject. Seeking to estimate the true value of the phenomenon as a sign of fetal distress, we have studied its frequency and significance in a series of 5,534 cases delivered on the obstetrical service of the University of California Hospital up to January 1, 1925.

Ludwig Knapp's historical review of this subject in 1897 is of much interest. Since the fetal heart has been recognized only in comparatively recent time, any other sign of impending fetal danger would have been of great value to the ancients. Völtern's "neueröffnete Hebammenschule" in 1687 gives the first statement Knapp could find on the subject. "The most certain sign that the child is dead is when the umbilical cord tears, and when a tarlike material is expressed from the anus, although many children die who show nothing of this material." Völtern refers to an obstetric book by Cosmus Viardel in 1676. Viardel has considered the passage of meconium a sign of death of the fetus and states that this sign had not previously been recognized. Völtern contradicts the latter statement and mentions that German midwives had long considered this a certain sign of death.

In the time of de la Motte (1655-1737) the view of the authorities began to differ in that some consider the discharge of meconium as a sign of death of the fetus, while others assert the contrary, or consider it at most a sign of the danger of death. After discussing the difference of opinion, de la Motte mentions its significance under different conditions and states that with head presentations with long

labors, it is of bad prognosis and especially so when the cord prolapses with the head. But in unnatural births, its meaning is quite different. In cases where the child presents by the breech, meconium is almost regularly expressed and instead of meaning fetal death, it merely indicates pressure on the abdomen. In head presentations, it may mean that the child has died of other causes or become very feeble—so that an atony of the intestinal fibers has occurred and the meconium can no longer be contained in them. De la Motte's observations concerning the discharge of meconium during breech presentations and their significance in head presentations are reflected in most of the obstetrical writings of the time.

Little of value was contributed on the subject again until 1858, when Schwarz, in his important work on fetal asphyxia, considers it in detail. He summarizes his conclusions as follows: "If meconium does not appear, one may not conclude offhand that the fetus is alive and that its respiratory processes are entirely undisturbed. If it does occur, it means always the suppression or diminution of the placental respiratory interchange; if not of death of the fetus, at least of danger of its life in the act of birth. This sign calls for the closest observation, if not for active interference on the part of the obstetrician and frequently indicates an endangered condition of the child before any other sign, and especially a decreasing cardiac activity is perceptible."

Schulze, in 1871 distinguishes two types of fetal asphyxia, that occurring with and that occurring without premature respiratory movements. In the former type, meconium is passed into the amniotic fluid during the respiratory movements and the child shows inspiratory râles. In the latter, meconium is not passed and there are no râles. The slowing of the heart sounds before birth is the only symptom of asphyxia noted in these cases. In certain rare cases, the amniotic fluid contains meconium and yet the child is born without signs of asphyxia except for a few râles at the first inspiration. In such cases, he believes there has been a transient asphyxia, yet later placental respiration has become reestablished completely and has continued until the end of labor.

Jesse, in 1888, published the first statistical investigation of this subject. In 3304 deliveries in 20 years in Ahlfeld's clinic in Marburg, he found that meconium was passed in 314 cases or 9.5 per cent. Of this series, seventy-four children were born dead, seventy-four more or less asphyxiated and 176 without evidence of asphyxia. From this he concluded that the passage of meconium alone did not constitute an indication for rapid delivery. Yet, in spite of the statistical proof and the conviction of occasional authors, Jesse's conclusions were by no means generally accepted. In the texts of the period, although certain authors wish to limit the significance of this symptom, the prevailing opinion seemed to be that the passage of meconium was a certain sign of danger to the fetus through present or impending asphyxia, and was, therefore, an urgent indication for the termination of labor.

The careful work of Rossa in 1894, although performed on a comparatively small series of cases did much to clear up our knowledge of this subject. In a series of eighty-five cases passing meconium in a total of 574 deliveries, he found that sixty-seven, or 8.8 per cent were born without signs of asphyxia. Of these, there were a number in which meconium appeared many hours before birth. Increase in the length of time of the appearance of meconium before birth does not mean an increase in the percentage of cases of asphyxia, as we might believe, were meconium always an early sign of asphyxia as some authors maintain. His final conclusion is that we must learn to separate the passage of meconium from the conception of asphyxia in a large proportion of cases, and must markedly limit the significance of the phenomenon in the diagnosis of the latter condition.

The most recent contribution to the subject is by Gejrot of Stockholm in 1920. In 6437 cases of delivery in vertex presentation observed with this point especially in

mind, the passage of meconium during labor was noted in 369 cases, or 5.6 per cent. At birth, 83.5 per cent of these children showed no signs of asphyxia, 10 per cent were slightly asphyxiated, 3 per cent deeply asphyxiated, and 3.5 per cent dead. Children who passed meconium after rupture of the membranes were more likely to be born asphyxiated than those who passed it before. Especially when the membranes ruptured prematurely and meconium did not appear until many hours later was the prognosis very grave. The fetal heart tones were not altered in 80 per cent of his cases. Of the remaining 20 per cent, about one third were born either deeply asphyxiated or dead, and in this series the meconium appeared simultaneously with the onset of deep asphyxia.

In a series of 5,534 deliveries on the obstetrical service of the University of California Hospital, we have record of the appearance of meconium in the amniotic fluid in 182 cases, or 3 per cent. We have found, as did Rossa, that when cases are not studied with the definite point in mind that the passage of meconium may easily be overlooked; thus, in long, difficult labors it would be noted and recorded if it occurred, yet in short normal labors might escape observation, thus making its prognostic significance seem more serious than the actual fact. Thus, in 834 cases delivered on the outside service, all multiparae with short easy labors, meconium was noted in only seven cases or less than one per cent, while in a series of 1300 hospital cases where this point was being definitely studied, we have records of 101 cases, or 7.7 per cent. Most authorities emphasize the importance of distinguishing between cases which have passed meconium at some time prior to labor and show it dissolved in the amniotic fluid at the time of rupture of the membranes, and those cases which pass it during the process of birth. Fresh meconium is flaky and of the typical greenish-brown appearance. Old meconium imparts a uniform greenish tinge to the amniotic fluid which is quite different from that seen when the fetus has become macerated or from the discoloration due to blood.

Classifying our cases on this basis, we find that of the 182 cases, eighty-six showed the amniotic fluid stained with meconium at the time of rupture of the membranes, in sixty-one it was clear at the time of rupture, but meconium appeared before the birth of the child, while in the remaining thirty-five it was not noted before delivery, but the amniotic fluid following the child was discolored.

Of the first group of eighty-six cases, sixty-six were entirely normal at birth, six showed very slight evidence of asphyxia but soon cried lustily without special efforts at resuscitation, four were moderately asphyxiated requiring artificial respiration for several minutes, three were deeply asphyxiated but were resuscitated after prolonged effort while seven could not be resuscitated. Thus, in seventy-two, or 83.7 per cent of cases in which meconium appeared in the amniotic fluid at the time of rupture of the membranes, respiration was established immediately or in a very few minutes, without artificial aid.

Alterations in the fetal heart were absent in the cases which showed no asphyxia at birth. This series of cases indicates that meconium appearing in the amniotic fluid at the time of rupture of the membranes is usually not accompanied by fetal asphyxia. A few cases, however, presented definite asphyxia, and each of these had changes in the rate and rhythm of the fetal heart. In a considerable proportion of the asphyxiated cases, it could be definitely determined that the meconium was fresh. In others, old meconium was passed without signs of asphyxia at the time of rupture of the membranes, while later, sometimes after many hours, asphyxia developed from causes not yet operative at the time of rupture. In a few of these, it could be determined that fresh meconium was passed at this later time.

Meconium appearing later in labor when the fluid was clear at the time of rupture of the membranes was noted in sixty-one cases. The prognosis in this group is considerably more serious, yet 26 of these cases showed neither changes in the fetal heart nor evidence of asphyxia when born. Fourteen showed very slight asphyxia, making forty, or 65.5 per cent of the series in which respiration was normally established without artificial aid. Eight were born dead, seven deeply asphyxiated, five moderately so. These were all cases of prolonged difficult labor, and all showed changes in the fetal heart.

Thirty-five cases showed no meconium before the birth of the child, yet meconium appeared in the fluid following it. Nineteen were not asphyxiated, six slightly making 25, or 71.4 per cent which required no resuscitation. Six showed moderate asphyxia, and in three of these there was difficulty in delivering the body of the child, due to large shoulders. The fetal heart was normal when last noted in all of these cases, yet no observations are recorded in the moment just before birth. Four were deeply asphyxiated, one of these could not be resuscitated, death in this case probably occurring during the operative delivery from compression of a tight loop of cord about the child's neck.

Meconium appearing after changes in the fetal heart seems in a number of cases to signal the development of a very deep asphyxia. In five of the cases of fetal death, other evidence of fetal distress had already appeared, and operative measures were being undertaken or normal labor proceeding so rapidly that delivery was accomplished in a very few minutes, but the child, when born, could not be resuscitated.

In these cases, the meconium was undoubtedly the result of the deep asphyxia, and indicated the development of the sphincteric relaxation of death.

The theory that meconium appearing in cases showing no signs of asphyxia at birth means merely a very early asphyxia, not as yet

detectable by other means, is contradicted by these cases in which meconium does not appear until asphyxia is far advanced, and even more by cases in which fatal asphyxia develops without the appearance of meconium in the amniotic fluid. Such cases are not rare, and Altenbach has shown that it is particularly apt to happen where death of the fetus is due to severe hemorrhage, as in placenta previa, or from premature separation of the placenta.

It appears probable then that in the cases which appear normal at birth, asphyxia has not been a factor in the passage of meconium, and we must seek for other factors in the child, or influences which might act on the child through the mother, such as toxic states of the mother or drugs administered to her.

Rossa's contention that an overdeveloped child might pass meconium because the bowel became too full is of interest. Previous authors have stated that children passing meconium usually fell within the normal limits of weight, yet in reviewing our cases we find that 13.7 per cent weighed over 4000 grams, while the average incidence of children of this weight in this clinic is only 4.3 per cent. Pressure on the abdomen during the delivery of the large body could account for only a small percentage of cases, since in 80 per cent the meconium appeared before the delivery of the child, and only in 20 per cent in the afterwaters. The percentage of asphyxia in the larger children who passed meconium is not greater than in the smaller ones, since 80 per cent were born normal or with very slight asphyxia. Deeper asphyxia, which we might expect as a result of more difficult labors, was even more rare. There was but one death in this series, and only one other child which was deeply asphyxiated. A number of the cases of moderate asphyxia had had difficulty in delivery from impaction of the shoulders.

In considering toxic states of the mother which might react upon the child, we have reviewed the cases presenting hypertension or urinary changes but have been unable to find that there is an increased number of cases passing meconium in mothers showing these evidences of toxemia. Rossa has suggested that severe infectious diseases in the mother might influence the child and cause it to pass meconium. In a study of forty-five cases which developed influenza during pregnancy or labor in the recent pandemic, none showed meconium during labor.

Our investigation of various drugs given to the mother in the course of labor gives equally negative results.

The experiments of Porak, later confirmed by Runge, seemed to show the meconium was passed very frequently during labor by children whose mothers had received a comparatively large dose of quinine (1-1.5 gm.) at its beginning. There was no slowing of the fetal heart or other sign of asphyxia in these cases. Our results fail to con-

firm these observations, since in a series of 385 cases in which labor was induced by castor oil, 30 c.c and quinine gm. 6 repeated once, the incidence of meconium intrapartum was about one per cent less than the average incidence over the same period of time. The castor oil administered to these mothers had no apparent effect on the child nor did any other cathartic administered early in labor.

The possible effect of anesthetics had been considered. Nitrous oxide analgesia has been used in the large majority of the last 3000 hospital cases; chloroform or ether was used earlier and ether is still occasionally used in operative deliveries. A comparatively small series of cases received scopolamin-morphine and recently Gwathmey's synergistic analgesia has been used in selected cases. No effect of the anesthetic on the passage of meconium could be observed in any of these cases.

As a result of this study, the following conclusions seem warranted.

The passage of meconium by the child during labor is in the large majority of cases entirely independent of fetal asphyxia. The passage of old meconium at that time of rupture of the membranes is of no prognostic value as to the later development of asphyxia. The cause of the passage of meconium in cases without asphyxia cannot be definitely stated, but is apparently independent of the maternal condition, or of drugs administered to the mother. A strikingly high proportion of overlarge children pass meconium, in most cases without serious significance.

Fresh meconium, appearing with rupture of the membranes or later in labor, may or may not be associated with asphyxia. In cases associated with asphyxia, changes in the fetal heart are invariably present, and the latter should, therefore, be the sole guide as to the necessity for operative interference. Meconium appearing after other signs of fetal distress is frequently a sign of the onset of very deep asphyxia and the child may perish even though delivery be very rapidly accomplished.

REFERENCES

[1]Schwarz: Inaug. Diss. Leipzig, 1858.
[2]Runge: Centralbl. für Gynäk., Jan. 31, 1880, p. 49.
[3]Jesse: Inaug. Diss. Marburg, 1888.
[4]Rossa: Arch. für Gynäk., 1894, xlvi, 303.
[5]Knapp: Arch. für Gynäk., 1897, liv, 569.
[6]Kossman: München med. Wchnschr., 1900, xlvii, 313.
[7]Bumm and Payot: Précis d'Obstetrique, 1914, p. 496.
[8]Altenbach: Thèse de Paris, 1912.
[9]Gejrot: Hygiea, Stockholm, Dec. 16, 1900, lxxxii, 785.
[10]Schulze: California State Jour. Med., 1922, xx, 87.

CLINICAL INTERPRETATION AND IMPORTANCE OF THE FETAL HEART SOUNDS DURING LABOR

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AUSCULTATION of the fetal heart sounds is the most reliable method of determining the condition of the child during labor. There is no doubt, however, that this method of examination, which has been so greatly facilitated by the introduction of the De Lee-Hillis head stethoscope, is much neglected in the majority of labors, either through failure of the obstetrician to appreciate its importance, or through lack of attendance during most of the labor. There also exists considerable confusion of opinion in the interpretation of the heart rate as an evidence of impending asphyxia in the fetus.

It is quite generally accepted that 120 is the lower limit of the normal rate and that further slowing down to 100 indicates threatened asphyxia. If the rate goes below 100 and shows a progressive and persistent decrease, a serious danger of asphyxia exists and delivery is urgently indicated. However, the statement is frequently made in textbooks and literature that an abnormally rapid fetal heart rate, above 160, also indicates threatened asphyxia, especially if preceded by a preliminary slowing, and is likewise an urgent indication for delivery. Personal observations and experience seem to indicate that the latter statement is true only in very rare instances, if at all; if not true, its mention can only serve to detract from the emphasis which should properly be placed on an abnormally slow fetal heart rate.

The following report is based on personal observations in a series of 200 private obstetric cases consecutively chosen, except for the omission of cases in which some complication or the manner of delivery interfered with frequent auscultations. The fetal heart sounds were noted at intervals of one-half to one hour in the first stage and at five to fifteen minute intervals or less, during the second stage.

Classification.—The rate of the fetal heart sounds was taken as a basis for the following classification:

1. Cases in which the fetal heart sounds were invariably above 120 per minute.

2. Cases in which the fetal heart sounds were temporarily or persistently from 100 to 120, seldom going below 100, or if so, only exceptionally and briefly, during and just following the contractions.

3. Cases in which the fetal heart sounds showed a persistent and progressive slowing below 100, both during and between the contractions.

4. Cases in which the fetal heart sounds ceased during labor.

Partial asphyxia was diagnosed in babies showing a slow and often weak heart beat of 100 or below and a delay in respiration and cry from one to several minutes or more. Of these, there were seven babies in a condition of severe pallid asphyxia at birth, requiring active resuscitation and in six of these there were found one or more coils of cord around the neck or (one case) an occult partial prolapse of the cord. Prompt forceps delivery probably saved some of these babies.

Analysis and Results.—In Class 1 there were found 151 cases. One coil of cord was found around the neck in forty-six cases; two coils in five cases—a total of 33 per cent. Partial asphyxia was evident at birth in six cases or 3.9 per cent. One baby died on the fifth day from hemorrhagic disease, which mortality was manifestly in no way attributable to birth trauma or asphyxia. There were twenty-eight low forceps, ten mid forceps and ten Scanzoni forceps deliveries in this class—an incidence of 31 per cent.

In Class 2 there were found thirty-nine cases. One coil of cord was found around the neck in fifteen cases; two coils in six cases and three coils in one case. In addition there were two cases of partial prolapse of the cord (a loop of cord prolapsed to the level of the neck) and one case in which the cord was wrapped twice around the leg—a total of twenty-five cases (64 per cent) in which there was a possibility of more or less interference with the circulation in the cord. Partial asphyxia was evident at birth in eight cases or 20 per cent—approximately five times as many as in Class 1. There was no infant mortality. There were ten low forceps and two mid forceps deliveries in this class—an incidence of 30 per cent.

Inasmuch as forceps were used with the same relative frequency in Classes 1 and 2, but the incidence of partial asphyxia was five times as great in Class 2, it would seem evident that the use of forceps *per se*, was not a factor in producing the condition of partial asphyxia at birth. The difference was evidently due to the greater frequency of interference with the cord circulation, manifested by a moderate slowing of the fetal heart rate during labor.

In Class 3 there were found nine cases. One coil of cord was found around the neck in two cases, and two coils in two cases. In addition there was one case of partial prolapse of the cord; one case in which the cord was short, measuring about 25 cm., and one case of velamentous insertion of the cord, making a total of 7 cases or 77 per cent in which there was a possibility of more or less interference with the circulation in the cord. Partial asphyxia was evident at birth in five cases or 55 per cent—almost three times as frequent as in Class 2 and fourteen times as many as in Class 1. There were six low forceps and one mid forceps deliveries—an incidence of 77 per cent. Two babies in this class were lost.

Mrs. J. S., aged thirty-five, gravida i, went into labor at full term, September 19, 3:30 A.M. The pelvic measurements were normal and the baby was in O. R. A. position. The labor pains were of average frequency and severity. At 11:30 A.M., September 20, the fetal heart rate which had been 140 to 150 most of the time was found to be decreasing and reached 100 to 110 by 11:35 A.M. The membranes were unruptured. Preparations were made for forceps delivery. Continued auscultation showed a progressive and persistent slowing down to 60 to 70 by 11:40 A.M. Auscultation just before application of forceps showed the heart exceedingly slow, about 10 to 15 per minute. The forceps delivery could not be completed rapidly enough owing to the fact that the head was in the midpelvis and the cervix not dilated more than 8 to 9 cm. A stillborn, seven and one-fourth pound male baby was delivered at 12:05 P.M., and was followed by a large amount of meconium. There was one coil of cord about the neck. The placenta showed no abnormality to account for the death of the baby. Permission for necropsy could not be obtained.

Mrs. E. A., aged twenty-seven, gravida i, went into labor at full term August 14, 7:00 A.M. The pelvic measurements were normal and the baby was in O. L. A. position. The second stage began about 7:00 P.M., and at 10:00 P.M., the fetal heart sounds which had been 125 to 140 most of the time, decreased to 100 to 110. By 10:45 P.M., a persistent and progressive decrease to 80 to 90 was found and as the head was on the perineum and the cervix fully dilated, a forceps delivery was done, a seven pound male infant being born at 11:10 P.M., in a state of pallid asphyxia. There was no coil of cord around the neck and no prolapse of cord. The heart beat was 30 to 40 per minute and very weak. Regular breathing was established after two hours of resuscitation, but death occurred four hours later. Necropsy showed petechial hemorrhages over the pleurae and epicardium, also hemorrhage in the adrenals, but no intracranial hemorrhage. Although no definite cause for interference with the cord circulation could be determined in this case, asphyxia may have been due to an occult prolapse of the cord.

It is evident, therefore, that a persistent and progressive slowing of the fetal heart rate below 100 is a danger signal of the greatest importance, and is an indication for prompt delivery, if this can be done without undue risk to the mother.

In Class 4 there was found but one case.

Mrs. W. H., aged twenty-four, gravida i, due July 17, went into labor July 28, 3 P.M., following a dose of castor oil and quinine. The baby was in O. R. P. position. The patient felt fetal movements early in the afternoon, but when seen at 7 P.M., auscultation showed absence of the heart sounds. From this time on no evidence of life could be obtained. A ten pound female infant was delivered by mid forceps (Scanzoni), July 29, at 4 A.M. There was no coil of cord around the neck or evidence of prolapse. Permission for necropsy could not be obtained. Presumably there was an occult prolapse of the cord in the early stage of labor, shutting off the cord circulation. It is doubtful if this baby could have been saved, even though the early signs of impending asphyxia had been discovered.

There were two patients in the entire series of cases, each of whom gave a history of having lost a baby in a previous confinement, stating that movements ceased toward the end of labor and the baby was born with a coil of cord around the neck. Such a history is not uncommon in

	NUMBER OF CASES	COIL OR PROLAPSE OF CORD OR OTHER FACTOR	ASPHYXIA	DEATHS	FORCEPS
Class 1	151	51 (33 per cent)	6 (3.9 per cent)	0	48 (31 per cent)
Class 2	39	25 (64 per cent)	8 (20 per cent)	0	12 (30 per cent)
Class 3	9	7 (77 per cent)	5 (55 per cent)	2	7 (77 per cent)
Class 4	1	0	0	1	1

Explanation—Class 1: fetal heart always above 120.
Class 2: fetal heart 100-120.
Class 3: fetal heart persistently below 100.
Class 4: Cessation of fetal heart before delivery.

multiparae and indicates the increased danger to the fetus attributable to this complication.

The entire emphasis in this series of cases is placed on a fetal heart rate below 120, for the reason that in no case was there found a heart rate which persisted above 160. In fact, there was seldom even a temporary increase to 160 and in the majority of cases, the rate was found to be 125 to 140, tending to be somewhat slower toward the end of the first and through the second stage. There was also no case in which a variability in rate or irregularity in rhythm was so marked as to indicate a need for interference.

The heart rate in an infant born partly asphyxiated and failing to be resuscitated has invariably, in the writer's experience, finally ceased after a progressive and persistent slowing and has shown no tendency to become temporarily very rapid or show more than a slight irregularity in rhythm. It is only reasonable to believe that the same characteristics hold true for fetal death during delivery, as the statistics presented seem to show. In about one-third of the cases, the slowing was first noticed in the last hour of the first stage and usually continued through the second stage. In the majority of cases, the slowing was first observed in the second stage. This may possibly be explained by the tension of the cervix as it encircles the neck or by pressure of the cord against the pubic bone, since the head is usually low enough at this stage to permit such pressure. For this reason it is particularly important that the physician be present at least from the latter part of the first stage on to delivery and follow the fetal heart rate at five to fifteen minute intervals up to the time of delivery. The more frequent interval of examinations is indicated in those cases showing a moderate slowing (Class 2) meanwhile making preparations for delivery, and continual observation is necessary in those cases showing tendency to progressive persistent slowing below 100 (Class 3).

The De Lee-Hillis head stethoscope is of the greatest value in properly following the fetal heart sounds in labor and is practically indispensable during the second stage of labor. The writer has found a modification of this instrument, made by Pilling Son & Co., permitting some adjustment of the end piece by a double universal joint, to be equally efficient and more convenient.

SUMMARY

Analysis of 200 consecutive private obstetric cases on the basis of the fetal heart rate during labor, showed that as the heart rate was found to be slowed from a normal rate of 120 or above, to 100, or further slowed to a rate persisting below 100, there was an increasing proportion of babies showing partial asphyxia at birth and an increasing incidence of intra and postnatal deaths from asphyxia. The use of forceps to deliver babies showing evidence of impending asphyxia did not increase the incidence of partial asphyxia at birth or cause fetal mortality after birth, probably due to the fact that in the majority of these cases, the head was already on the perineum or partly crowned and could be delivered with comparative ease.

CONCLUSIONS

1. The fetal heart rate is usually 125 to 145 during labor, tending to be somewhat slower in the second than the first stage. A rate of 120 per minute is the low limit of normal.

2. A fetal heart rate of 100 to 120, strongly suggests some interference with the circulation, usually from pressure on the cord around the neck or partially prolapsed, etc., and is an indication for more frequent auscultations, and making preparations for possible forceps delivery.

3. A fetal heart rate, persisting below 100 and tending to a progressive decrease is an indication of impending asphyxia and necessitates immediate forceps delivery.

4. A rapid fetal heart rate of 160 or above is not an indication of threatened asphyxia and does not require interference.

5. The physician should be in attendance especially at the end of the first and throughout the second stage and auscult the fetal heart sounds at intervals of five to fifteen minutes or less in order to detect evidence of threatened asphyxia.

6. Forceps delivery does not appear to increase the tendency to asphyxia.

REFERENCES

[1]Reed, C. B.: Surg., Gynec. and Obst., May, 1918, xxvi, 545.
[2]Sachs, E.: Ztschr. f. Geburtsh. u. Gynäk., February, 1920, lxxxii, 284. Abstr., Jour. Am. Med. Assn., February 5, 1921, lxxvi, 417.
[3]Fry, E.: Ztschr. f. Geburtsh. u. Gynäk., December 18, 1924, lxxxviii, 261. Abstr., Jour. Am. Med. Assn., February 21, 1925, lxxxiv, 635.

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THE DANGER OF CERVICAL EROSION

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ASSUMING that statistics vary according to interpretation and the purposes for which they are compiled, it is difficult indeed not to be impressed with the importance that the uterus plays in the incidence of cancer. Welch in 31,000 cases of cancer collected from the literature, found 20.5 per cent involving the uterus and 21.4 per cent occurring in the stomach. British statistics place the incidence of uterine involvement as high as 38 per cent. While this is undoubtedly rather high it substantiates the contention that carcinoma of the uterus is of the utmost importance at all times whenever and wherever the "Cancer Problem" is discussed. Realizing the fact that the cervix presents by far the greater proportion of malignant change, a difference in percentage so great that it can in all probability be explained only by some local environment or predisposition, it would seem that too much stress cannot be laid upon the eradication of those underlying etiologic factors which at the present time we recognize as playing an important rôle in furnishing the stimuli necessary to malignant transformation.

For all practical purposes the frequency of cancer of the cervix in the virgin is negligible but when encountered, the same etiologic factors, in part at least, must be considered. Here, of course, the cervix has not been tormented by the presence of old lacerations, scar tissue formation or, as in some instances, even a low grade infection but, on the other hand, it is highly probable that a certain percentage of these have endured the irritation of the congenital types of erosion over a considerable period of time.

In that class of patients who are, or have been, married we find a decided increase in the percentage of cervical malignancies. Here again there can be no doubt but that this part of the uterus has had every opportunity of a low grade chronic type of irritation, the cause of which in this class of patients must of necessity be some type of infection, venereal or otherwise, which has produced first an acute and subsequently a chronic erosion resulting in more or less definite tissue change and lasting over varying lengths of time.

There is universal agreement that cancer of the cervix is, by far, most prevalent in those women who have borne children and in whom are found to a greater or lesser degree the results thereof, namely, laceration, scar tissue, erosion, and secondary infection. That many women bear children and never at any time present any of the above-

mentioned conditions, there can be no doubt. Many women also who have experienced childbirth never develop cancer of the cervix; still, the percentage is so high in this class that it is impossible to ignore the part that pregnancy and delivery must play in, at least, helping to prepare the way for the predisposing factors which lead up to the time when cell control is weakened, or lost entirely, and malignant transformation begins.

Erosion of the cervix resulting either from laceration, infection, or as a failure of the glandular mucous membrane to recede properly and limit itself within the confines of the external and internal os, as seen in the congenital types of this condition, lends itself beyond

Fig. 1.—Marked dilatation of cervical gland with beginning periglandular infiltration.

doubt to the production of a chronic irritation in this region. To quote C. H. Mayo, "the part played by chronic irritation in the development of cancer is positive and definite to a degree. The danger of cancer is increased by all irritation and traumatism which demands a continued cell repair, and it is in proportion to that demand. Ultimately exhaustion of cell control bodies occurs, modified by age limitations and chemical surroundings. Such areas offer an increasing opportunity for the half of a dividing cell to revert to the unicellular type of life and to become parasitic and cancerous." The term erosion of the cervix is in no way applicable to the condition since, instead of loss of tissue as the name implies, we actually have a proliferation which in some instances becomes quite marked.

In the congenital type of erosion we find a failure of the glandular mucous membrane which pouches out beyond the external os in the fetus, to recede as it should normally within the confines of the cervical canal. This membrane when subjected to the action of the acid secretions of the vagina and subsequent secondary infection, must of necessity undergo a siege of chronic irritation. In addition it seems that organisms are more active when encountered in the presence of a misplaced membrane, probably due to the fact that such a membrane cannot possess or develop the degree of immunity normally found in nonpathologic tissues.

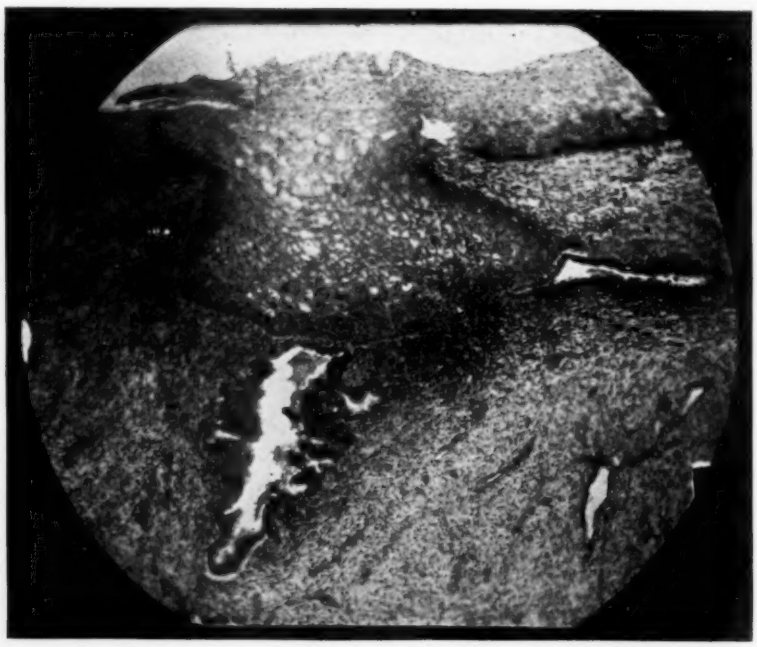

Fig. 2.—Local down growth of squamous epithelium causing interference with drainage of underlying gland, with retention of secretion and beginning formation of nabothian follicle.

The actual infections of the lower genital tract sooner or later limit themselves in most instances to the cervix and by causing an edema of the submucous and periglandular tissues, produce a rolling out or eversion of the membrane lining the canal and result in erosion. Here again we find a membrane deposited into an acid medium and subjected to a chronic type of irritation over a varying length of time.

The cervix which experienced the delivery of a child is almost certain to sustain a laceration, the extent of which varies with the individual case. More often than not, however, complete anatomic restoration does not ensue and in the vast majority of such cervices, scar tissue replacement, erosion, and secondary infection results. It is this type of cervix especially that warrants careful consideration. Many of the

minor lacerations heal in anatomic restoration with minimum scar tissue and the cervix to all intents and purposes resumes a condition most similar to the normal. It is not this type of cervix that should concern us but how can we be certain that such exists after delivery unless a careful ocular examination be made?

Ocular, together with a bimanual examination, will reveal a surprisingly large number of erosions associated with lacerations of the cervix which might otherwise go unrecognized. This type of cervix is found in those cases with a small laceration but in which a secondary infection has persisted which causes a rather marked amount of

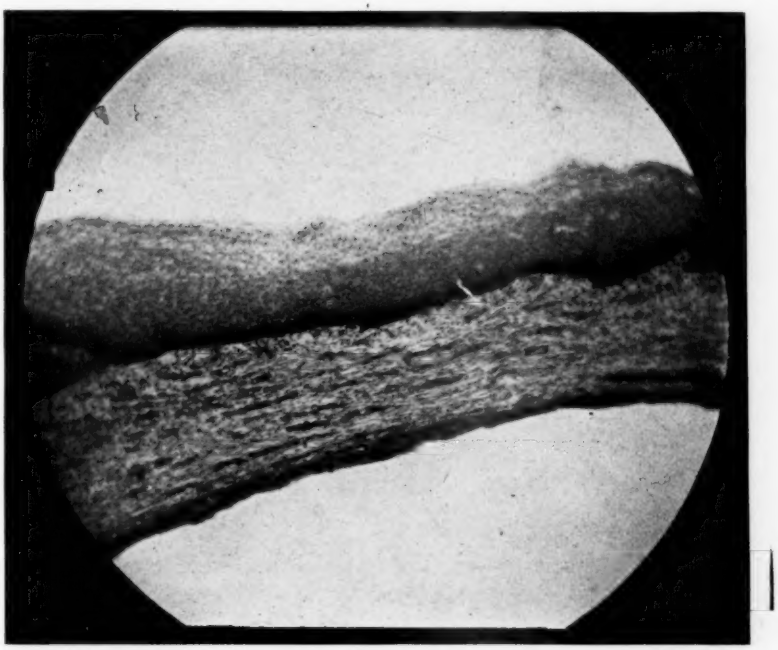

Fig. 3.—Section of portion of nabothian follicle (retention cyst).

submucous fibrosis. This enables the membrane of the canal to be more easily rolled out beyond the external os and to remain so. It is possible that in such cases the palpating finger may not detect the presence of erosion because of the absence of palpable scar tissue resulting from a healed laceration of this degree. The only presenting symptom may be a persistent leucorrheal discharge which has resisted ordinary treatment. Not infrequently some form of vaginal douche has been the only therapeutic measure employed and the history will reveal that a thorough vaginocervical examination has never been made by the attending physician. There can be no doubt that this type of cervix has been or may continue to be, if treated as mentioned above, the seat of chronic irritation and traumatism.

Lacerations of the cervix as a result of childbirth which have gone unrepaired in anatomic deformity associated with deep scars and a mechanical eversion of the mucous membrane lining the cervical canal are most common. The erosions attendant in these cervices seldom entirely heal and rarely, if ever, do we encounter them free of secondary infection. The columnar epithelium of the canal after being deposited within the vagina undergoes adenomatous hyperplasia. When viewed through the speculum this area appears as a red velvety patch which tends to bleed upon manipulation and looks not unlike granulation tissue. This no doubt accounts for the term "erosion." Microscopically, however, the picture is not of tissue loss and erosion

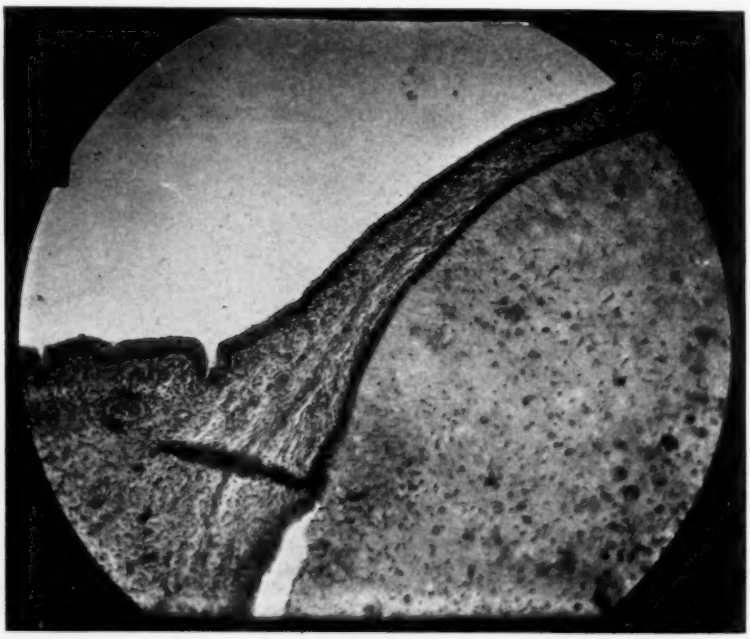

Fig. 4.—Portion of cystic gland of cervix showing accumulation of retained secretion.

but rather that of "proliferative adenoma of the cervix" as suggested by Eden and Lockyer. Under the microscope the area of erosion is covered with a single layer of columnar epithelium. The continuity is interrupted by the ducts of the glands. These glands become greatly enlarged and in some instances extend for a considerable distance into the underlying connective tissue. Very often they are of normal size, but greatly increased in number. In many specimens they are found swollen, dilated and filled with mucus, the columnar epithelium being distended with secretion. When this secretion does not find ready exit via the ducts, the lining membrane may become flattened because of the pressure resulting from the accumulation of

retained secretion. An inflammatory reaction is found in most instances within the stroma.

Microscopically the area of erosion is of the "follicular type" when the glands are dilated and filled with secretion. In some instances complete obliteration of the ducts is encountered resulting in the formation of various sized retention cysts that tend to encroach upon the vaginal portion of the cervix and are seen as thin walled dome-like cysts. The "papillary erosion" consists of small papillary projections caused by an increase in the stroma. It is this type that appears not unlike a granulating surface. Some cervices present a distinct hyperplasia of the glandular element for which the term "adenomatous erosion" would seem to be most appropriate. Often no one particular type predominates but rather a combination of the above-mentioned varieties and in such instances we have merely a "simple erosion."

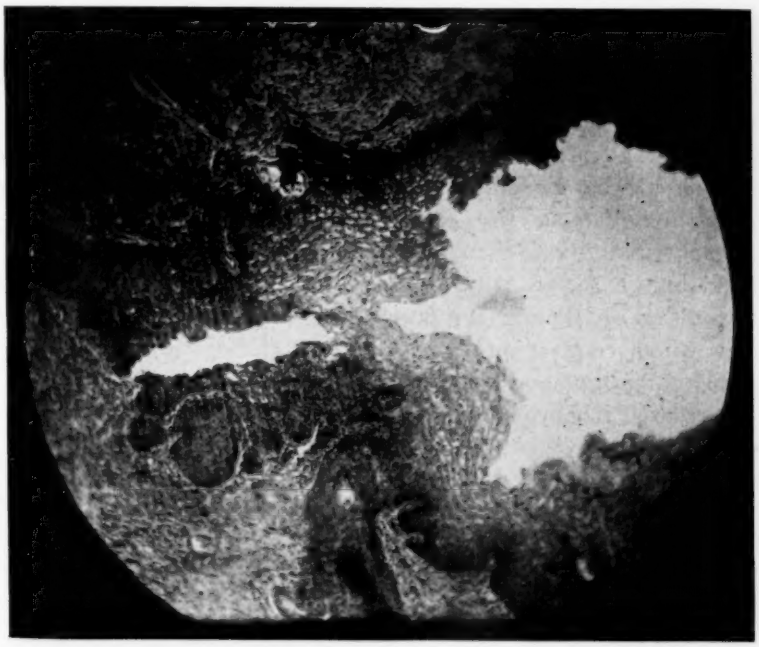

Fig. 5.—Early epidermoid carcinoma in bottom of old laceration. This cervix presented one area of early malignancy in the presence of an erosion of long standing.

Should a section of the cervix be cut for microscopic examination so as to include the junction between the vaginal portion and the erosion proper, it will be noticed that the misplaced membrane bulges out past a sharp line of demarkation, while on the other end the process fades gradually into the membrane still lining the canal.

The earliest stages of cancer of the cervix are seldom recognized grossly. When diagnosed by gross examination the disease is more

advanced, usually presenting (1) marked induration and swelling of the cervix; (2) an excavating ulcer, or (3) extensive papillary or cauliflower projections covering either the canal, portio, or both. When these gross changes are found and diagnosed early, the prognosis while guarded is at least not hopeless under proper, radical, therapeutic measures. Even then we cannot be certain of the absence of metastasis so that the condition still remains one of grave importance in so far as the welfare of the patient is concerned. Ewing states, "the earliest cervical carcinoma that I have seen consisted of a localized downward growth of the hypertrophied papillae in portions of chronic erosions." "In another case a chronic erosion showed early squamous epithelium of its edges and beginning neoplastic overgrowth and metaplasia of the cylindrical cells in the gland ducts. The ease with which the cylindrical mucous cells and squamous cells replace each other has been definitely demonstrated so that the high percentage of epidermoid types of carcinoma can easily be explained." The beginning epithelization of the cervical canal past the area of erosion should be considered as a rather suspicious activity upon the part of the squamous epithelium and while not always indicative of very early malignant change should, however, receive more than a passing thought.

It would seem that in the present state of our knowledge of those factors which tend to predispose to the etiology of cancer the percentage of malignancies originating in the cervix might be appreciably decreased if more serious consideration be given to its pathology. Immediate or, at least, early operative restoration of the normal anatomic arrangement of the cervix when grossly lacerated during childbirth would greatly diminish the possibility of erosion, scar tissue, and secondary infection. In old lacerations where the associated irritative conditions have become chronic, operative removal of the tissue involved would seem to be the method of choice. Excision of the scar and chronically infected mucous membrane with plastic repair is indicated, assuming, of course, that there are no associated pathologic conditions higher up in the pelvis requiring hysterectomy. In the absence of lacerations, acute erosions, and infections, the proper application of germicidal agents in conjunction with cervical diathermy may give gratifying results. When the erosion and infection become decidedly chronic as evidenced by fibrosis and periglandular infiltration, medicinal treatment alone rarely, if ever, produces any marked improvement and the condition had best be treated by either radium or surgery.

SUMMARY

In the light of our present knowledge of those factors which seem to play an important part in the causation of cancer of the cervix, too much emphasis cannot be placed upon the value of the eradication

of all sources of chronic irritation and traumatism. Lacerations of the cervix following childbirth, when not repaired in anatomic restoration along with the chronic secondary infections which occur in every instance, are productive of the various types of cervical erosions. Inasmuch as these erosions are always the source of chronic irritation, it would seem that more attention should be given to the cervix immediately after delivery as a prophylaxis in the treatment of this condition. In those patients in which immediate repair has not been accomplished and the pathology of the cervix has become chronic, the local condition should be viewed as a definite source of danger and treated accordingly.

REFERENCES

Corbus, B. C.: Surg., Gynec. and Obst., January, 1924, xxxviii, 119.
Couvert, C.: Riforma med., February, 1924, xl, 152.
Cummings, H. H.: Jour. Mich. State Med. Soc., December, 1923, xxii, 499.
Dickinson, G. K.: Am. Jour. Obst. and Gynec., February, 1923, v, 124.
Eden and Lockyer: New System of Gynecology, Vol. ii.
Ginsburg, N.: Jour. Mich. State Med. Soc., March, 1924, xxiii, 98.
Kerwin, W.: Am. Jour. Obst. and Gynec., August, 1923, vi, 185.
Langstroth, F. W.: Med. Rec., May 21, 1921, xcix, 857.
Mayo, C. H.: Jour. Canad. Med. Assn., 1918, viii, 786-790.
Reel, P. J.: Ann. Surg., February, 1920, lxxii.
Rowlett, W. H.: Jour. Florida Med. Assn., July, 1923, x, 1.

SOME DEBATABLE FEATURES OF CURETTAGE OF THE UTERUS*

By George Gellhorn, M.D., F.A.C.S., St. Louis, Mo.

IT seems, at first sight, highly improbable, if not impossible to find grounds for an argument on so long-established and typical a procedure as curettage of the uterus. Its fundamental indications, namely, abortion, polyps, and carcinoma, are generally accepted. While some men confine themselves fairly strictly to these three indications, others appear to perform the operation for a multitude of reasons; and we must needs conclude, that in regard to the *indications,* a consensus of opinion has not yet been established. To discuss this phase of the subject, however profitable, would lead us too far afield, though it might well be undertaken at some future occasion. For the present, I merely wish to propose as the topic of debate the *technical* aspect of curettage.

Following the steps of the operation, we may begin with the introduction of the sound to determine the depth of the uterine cavity. To decide by it the *direction* of the uterus without a preliminary bimanual examination is, I dare say, a thing of the past; and in consequence, perforation from this source has become less frequent.

*Read before the St. Louis Gynecological Society, February 14, 1925.

Dilatation is generally carried out by means of graded instruments of the type of Hegar's dilators.* These dilators are not always selected with sufficient care. Not only are they usually too long, since the dilatation need not go beyond the internal os, but pointed dilators should be eschewed in favor of those with rounded tips; another source of perforation would thereby be eliminated. The dilatation is continued to No. 8 or 9; in cases of abortion, thicker stems, as high as Nos. 12 and 15, are used. That these dilators will slip in more easily if wet or lubricated is apparently unknown to many. The Hegar stems are often followed up by a dilator of the glove-stretcher variety—an illogical procedure, so it seems to me, since the cervical canal can be spread only in one direction. The metranoikter of Hirst or the Bossi dilator would serve the purpose much better but both are very cumbersome instruments. Haste or undue force may sometimes result in an incomplete rupture of the uterus at the internal os. This accident has once been of unexpected benefit to me as it permanently cured a fibrous stenosis with its train of symptoms, but as the extent of the tear can never be foreseen and untoward results are more likely to happen, any injury of the internal os should be carefully avoided.

In the long, rigid, and stenosed cervix of a nulliparous woman which barely permits the passage of the uterine sound, dilatation becomes a real problem. Multiple shallow incisions of the internal os by a long slender knife with protected blade were made in former years, and more recently recommended again by Boldt, but the obscurity of the procedure, the impossibility of gauging the depth and direction of the cuts, and the chance of their tearing deeper, are serious drawbacks. In such cases the dilatation with sea tangle tents (laminaria) seems preferable though the repeated introduction of foreign bodies over one or more days invites infection. The tents may be disinfected by placing them in pure phenol for eight hours and then in absolute alcohol for twelve hours. They are then dipped in boiling water to give them a suitable bend, and introduced well lubricated with sterile glycerine.

The systematic scraping away of the uterine mucosa in strips is uniformly carried out. That the tubal corners are the favorite sites of pathologic changes, particularly in the case of polyps or early cancers, has, however, not become common knowledge of the profession. These uterine angles call for a smaller curette than does the rest of the uterine cavity. I can see no advantage in the flushing curette which so often forms a part of the instrumentarium. On the contrary, there seems to me the danger of the fluid—usually a mild antiseptic—being injected into the peritoneal cavity through an accidental and

*It is probably agreed—at least, among gynecologists—that a gaping and presumably infected cervical canal must be wiped out and disinfected before any instrument is introduced; and, further, that no instrument must touch anything on the way to the external os, a self-evident precaution which too often is violated flagrantly.

undiscovered perforation, or into the tubes whose uterine ostia may be relaxed in deep narcosis.

It always seems difficult to me to properly gauge the energy employed in scraping. The old teaching that curettage should be continued until the grinding muscle tone of the instrument on the uterine musculature can be heard, seems faulty. I am distressed to find, on microscopic examination, muscle tissue in my sections. It means that the basal layers have been removed inadvertently and that normal regeneration is apt to suffer. The preliminary injection of pituitrin may solve the question, and systematic investigations of this problem are now being carried out in my department. Particular caution, it seems to me, is needed at the internal os where all the strokes of the curette converge. Traumatism at this place may well lead to a cicatricial stenosis which might conceivably give rise to dystocia later.

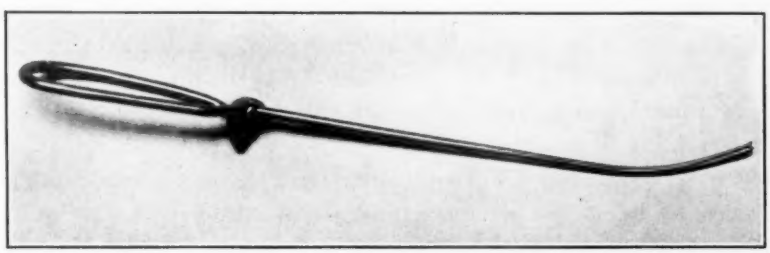

Fig. 1.—Special gauze packer with grooved notch at tip to prevent strip from being withdrawn when instrument is taken out.

Mouchotte[1] and Schweitzer[2] have recently reported several cases of this sort.

As the microscopic examination of the scrapings is important *in every case,* the proper collection of the specimens is essential. The strips or particles of mucosa are usually caught on a piece of gauze, but the procedure of O. H. Schwarz[3] to collect them in sodium citrate solution is far preferable.

Applications to the uterine cavity immediately after the curettage are so diversified in nature that a discussion is desirable to clarify the situation. Irrigations through a Fritsch-Bozeman or similar double current catheter are supposed to wash out remaining particles of mucosa and to further drainage but either object is accomplished spontaneously, and the intrauterine douche has always seemed to me an unnecessary encumbrance of the simple operation. Wiping out the uterine cavity with pure phenol, followed by alcohol, has been a favorite procedure with the older generation. This method is not without danger. If the carbolic acid has not been neutralized everywhere, the cauterization may lead to an ulceration and the latter, if situated at the internal os, to a stricture which eventually may give rise to a hematometra or pyometra. I have removed no less than three uteri

for this indication. More recently, tincture of iodine or a 5 per cent picric acid solution in alcohol have largely taken the place of phenol. The antiseptic is usually conveyed into the uterus by cotton wound around a dressing forceps or applicator. In a narrow cervix, this may prove to be too bulky, or the spastic contraction of the irritated uterus may render withdrawal difficult. The simple packer designed by Asch (Fig. 1) which I have been using for twenty-five years, is a far better means of introducing narrow gauze strips soaked in the solution, into the uterine cavity.

What do we expect from this treatment? We are surely not deluding ourselves into the belief that we can eradicate infection by a few seconds' application of an antiseptic to an extensive wound cavity. That would be contrary to any modern conception of pathology. Is it not rather the alcohol in our solutions which distributes itself quickly over the entire surface, stimulates strong uterine contractions, and thereby forestalls infection? If this seems plausible, we might either use alcohol alone or omit this step altogether and inject pituitrin or ergot towards the end of the curettage. This would, also, obviate the entirely superfluous method of packing the uterus, a procedure which is only too apt to invite infection.

Curettage after abortion requires a separate consideration. Three methods of attack are in vogue, and we should be clear in our own minds which of these is the best.

"Finger curettage" combined with the use of the placental forceps is the first of these three methods. The necessary premise is that the cervical canal can be stretched sufficiently to admit one finger and, beside it, the placental forceps. This can hardly be accomplished before the third month, and even then, the use of gloves makes it extremely difficult, if not impossible, to loosen placental tissue from the uterine wall so that it can be caught and removed with the placental forceps. The employment of the latter, without preliminary finger curettage, has fallen into disrepute because of the numerous reports of perforation. I feel very strongly that the danger rests, not with the instrument, but with "the man behind the gun." I maintain that the experienced and cautious operator can avoid a perforation. A critical analysis of the cases in literature reveals an incredible ignorance on the part of the physician. Not until eight or ten feet of the mother's small intestines or a very large piece of omentum had been dragged out of the vulva did the danger dawn upon such operators. A certain, though, a very minor, part may be played by the type of placental forceps, and I personally favor Winter's model as the safest.

The blunt curette is the second and, at the same time, the most popular method of evacuating the uterus after abortion. I have tried a number of different blunt curettes and I confess, I have been unable to accomplish my purpose in many instances even after spending

much time and energy, for the blunt curette is almost certain to glide over the smooth placental tissue without detaching it.

I have, therefore, abandoned the use of the blunt curette altogether and only practice the third method of curettage after abortion, namely, by means of a sharp curette. For this purpose, a very much broader curette is required than in the nongravid uterus, which, in itself, is a guard against perforation. The blade need be only moderately sharp, and this will prevent us from scraping out too much of the basal mucosa and superficial muscular layer. The best protection, however, against both these complications is a full dose of pituitrin injected before the operation, and this has been my routine for several years past.

An intrauterine douche after the curettage seems superfluous to me as there is no obstruction to free drainage. Uterine tamponade, though required occasionally by excessive bleeding, is, as a rule, obviated by the pituitrin injection just mentioned, and moreover, car-

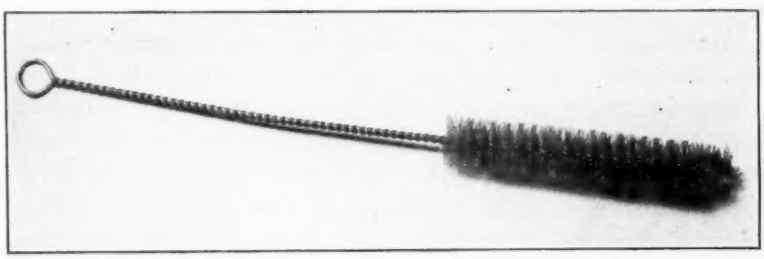

Fig. 2.—Brush for wiping out the uterus after curettage.

ries with it, theoretically at least, the possibility of infection. An injection of ergot after the operation may sometimes be given. The French method of *écouvillonage*, that is, the wiping out of the uterine cavity with slender, long-handled brushes (Fig. 2), is practically unknown in this country; it has occasionally given me good service.

Repeated mention has been made in this paper of perforation. This, of course, is the principal danger of curettage. No man is exempt from it. At times, it is unavoidable. I remember a case of curettage where I perforated the uterus two or three times with the uterine sound. I performed a vaginal hysterectomy immediately and could demonstrate on the extirpated uterus that the sound would penetrate the uterine wall by its own weight; microscopic examination revealed a fatty degeneration of the flabby musculature.

In the majority of cases, however, the accident is due to a slip in technic and, therefore, is preventable. I have already indicated some points in prophylaxis. Pituitrin, I believe, comes first; then, gentleness in dilatation and in the handling of all instruments, and finally, the largest possible size of curettes.

What should be our attitude after perforation has actually oc-

curred? If it is recognized at once, expectant treatment is probably sufficient. Ergot, morphine, and an ice bag are all that is needed. I have repeatedly operated on women whose uteri bore a small, white, stellate scar on the fundus as a remnant of an old perforation. In this connection, I again wish to call attention to the value of protein therapy and cite a case previously recorded by me. It concerns a young woman of twenty who was curetted for retained placental tissue five weeks after delivery. The cautiously introduced curette perforated the uterus immediately. Having witnessed the accident and observed the careful antisepsis, I counseled expectancy. Three days later, an abscess in the culdesac made its appearance and, within a week, rose as high as the umbilicus, accompanied by fever, hyperleucocytosis, and local peritonitic symptoms. Five milk injections sufficed to bring about a complete absorption of the abscess and restore the patient to perfect health which has now continued for almost three years.

In more extensive perforations or where intrauterine flushing has been practiced, a laparotomy is indicated and a hysterectomy may become necessary.

To men who are accustomed to think only in terms of major operations, a discussion of so simple a procedure as curettage, may seem humdrum and trifling. To the thoughtful gynecologist and obstetrician this little operation, a "beginner's operation," as it is often called, is far from commonplace. On its correct execution depends, in many cases, the future health of the patient. Closer scrutiny reveals many of its technical features obsolete and open to discussion. To clear away what is merely weight of tradition and to pave the way for a uniform, simple, and efficient technic, is the purpose of this paper.

REFERENCES

[1]Mouchotte: Revue franç. de gynéc. et d'obstét., 1922.
[2]Schweitzer: Zentralbl. f. Gynäk., 1924, xlviii, 2092.
[3]Schwarz, O. H.: Jour. Missouri State Med. Assn., 1919, xvi, 209.

METROPOLITAN BLDG.

PROLONGED AND SHORTENED GESTATION PERIODS FROM MEDICAL AND MEDICOLEGAL STANDPOINTS*

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SINCE time immemorial it has been customary to estimate the gestation period as ten lunar months. There is no doubt that this reckoning is correct in the great majority of cases, but it must always be borne in mind that the length of pregnancy is subject to no law, although it must be admitted that to some extent at least, circumstances may influence it. In this review no attempt will be made to go into the causes of shortened, normal, or protracted gestation periods, but it will be confined as much as possible to the legal aspects of the subject.

As in every other branch of medicine, we have to depend upon the findings in the lower animals for our conclusions so far as experimental work is concerned. In Reid's series of experiments in cows, he found that the gestation period varied from 260 days to 294 days, a mean of 277 days or a variation of 6 per cent from a single act of coitus. Another series shows a variation of from 252 days to 320 days, or 12 per cent, with a mean of 286 days. In mares, a variation of from 311 days to 394 days, or 12 per cent, with a mean of 352 days, has been demonstrated. The same variation naturally must occur in the human.

Ovulation is known to occur some time during the middle ten days of the intermenstrual period. It has been shown by Dührssen that spermatozoa may remain alive in the genital tract at least twenty-three days after insemination. From these facts it would be quite possible to explain many of the so-called protracted gestation periods.

When called to testify before a Court of Law, it should be remembered that it is not the duty of the physician to give his opinion of a case. All that is necessary is that he state facts. Judge F. B. Hutton, speaking before the Medical Society of Virginia, emphasized this in the following words: "It is a maxim of the law, and I may say, one of the familiar principles in the law of evidence, that the opinions of witnesses are, in general, irrelevant. Reasoning is the proper function of the judge, jury and counsel, and it is not a part of the normal function of the witness." All that is necessary to prove this to one's own satisfaction is to look over the records of a few cases which have been tried before the courts. Here can be found great variations in the length of the gestation period from a legal point of view.

Fortunate or unfortunate as it may be, there is no definite law laid

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down in any English-speaking country as to the actual length of the gestation period, although the old Scotch law says that 168 days is the earliest time at which a child may be born alive. In Austria, the law recognizes the legitimacy of the child born 240 days after marriage, or 307 days after the death of the husband. In France, the legitimacy of the infant born 300 days after the dissolution of the marriage is liable to be contested. That this law is not unanimously favored either by the civil or medical authorities is proved by the fact that in 1906, a commission was formed to alter the Civil Code, but unfortunately no great success was achieved. Article 252 of the Swiss Civil Code states: 1. "The child born during the marriage, or in the 300 days after the dissolution of the marriage has the husband for a father. 2. The child born after 300 days is not presumed legitimate." In an article entitled, "A Pregnancy of More than Three Hundred Days and Article 252 of the Swiss Civil Code," Maillart reports a case in which he saw a patient 47 days after the last menstruation, or 16 days after she had missed the last period. He found the cervix softened and also positive findings in the breasts. The patient was delivered of a baby girl weighing 4515 grams, 323 days after the first day of the last menstruation.

Of the cases which come before the Courts, there are two main groups:

1. When the child is born out of wedlock.
2. When the child is born in wedlock.

In this short review, no attempt will be made to give the details of medicolegal cases, nor will a series of such cases be given. Examples of cases and the decision reached will be quoted in each subdivision of the two aforementioned groups.

I. CHILD BORN OUT OF WEDLOCK

(1) Bastardy, where the question of paternity is at stake.

(*a*) In the case of Duck vs, The State *(ex. rel. Dill 17 Ind., 210)*, the defendant offered to prove that relatrix had had sexual intercourse 322 days before the birth of the child with another person and the evidence was rejected.

(*b*) In the case of Commonworth vs. Hoover, *(3 Clark, Pa., 514)* 313 days were allowed for the gestation period.

(*c*) In the case of United States vs. Collins, tried before the United States District Court for the District of Columbia in 1809, the Court limited the inquiry as to connection with other men than defendant to not more than twelve months nor less than six months before the birth of the child.

d In the case of Paul against Pedleford, *(16 Gray Mass. 263)* the Court refused to allow proofs of action of intercourse of the plaintiff with other persons than the defendant at a time more than ten months and twelve days before the birth of the child.

(*e*) In the case of Erickson vs. Schmidt *(62 Neb. 368)* although the man proved immorality on the part of the plaintiff with other men out-

side the normal gestation period, it was rejected and he was made to support the child.

(*f*) In the case of Commonwealth vs. Porter, *(Cambria Co., Pa.)*, the defendant was called the father of the child which was born 317 days after intercourse.

Because the question of paternity in bastardy cases makes up the large majority of cases which come before the courts, several cases have been cited which are more or less typical and where many different opinions were voiced. In case *a*, 322 days were considered too long for the gestation period. In case *b*, 313 days were allowed. In case *c*, twelve and six months were regarded as the outside limits of the gestation period. In case *d*, 312 days were allowed. In case *e*, the normal gestation period is not stated. In case *f*, the gestation period was considered to be 317 days.

(2) Born after death of father.

(*a*) In the case of Foster vs. Cook, *(3 Brown's Rep., Edin. 347)*, the child was born 43 weeks or 301 days after the death of the husband. The husband was considered the father of the child.

(3) Born after divorce or separation.

(*a*) In the Gardner Peerage case *(House of Lords, 1825)*, the former husband had been absent 312 days when the child was born. The child was called illegitimate because of the adultery proved on the part of the mother and not as far as the length of the gestation period was concerned.

(*b*) In the case of Russell vs. Russell, *(1924 A. C. Pt. 4, 687)*, in which a decision has just been handed down, the facts are quite different. The husband and wife, who were later divorced, occupied the same bed 290 days before the birth of the child, on two successive nights. The husband denied that there had been intercourse and proved adultery on the part of the wife with an unknown man during that time. But the evidence which he gave as regards there being no intercourse was not allowed. The child was called legitimate.

II. CHILD BORN IN WEDLOCK

(1) Before the expiration of the normal gestation period.

(*a*) In the case of Phillips vs. Allen, *(22 Allen, Mass., 453)*, the child was born eight months after marriage and was declared legitimate.

(*b*) In the Jardine case in Scotland, where the child was born 174 days after marriage and lived seven months, the libel against the parents was considered not proved.

(2) In absence of father.

(*a*) In the case of Luscombe vs. Pettyjohn *(Exeter Summer Assizes, 1840)*, it was shown that the husband and wife had last meeting 299 days before the birth of the child. The child was declared legitimate.

(3) Separation of husband and wife.

(*a*) In the case of Estate of McNamara, *(181 Calif. 82)*, the mother of the child left her husband to live with another man. The child was born 304 days after the last possible intercourse. Here the child was declared the son of the paramour and not of the husband.

down in any English-speaking country as to the actual length of the gestation period, although the old Scotch law says that 168 days is the earliest time at which a child may be born alive. In Austria, the law recognizes the legitimacy of the child born 240 days after marriage, or 307 days after the death of the husband. In France, the legitimacy of the infant born 300 days after the dissolution of the marriage is liable to be contested. That this law is not unanimously favored either by the civil or medical authorities is proved by the fact that in 1906, a commission was formed to alter the Civil Code, but unfortunately no great success was achieved. Article 252 of the Swiss Civil Code states: 1. "The child born during the marriage, or in the 300 days after the dissolution of the marriage has the husband for a father. 2. The child born after 300 days is not presumed legitimate." In an article entitled, "A Pregnancy of More than Three Hundred Days and Article 252 of the Swiss Civil Code," Maillart reports a case in which he saw a patient 47 days after the last menstruation, or 16 days after she had missed the last period. He found the cervix softened and also positive findings in the breasts. The patient was delivered of a baby girl weighing 4515 grams, 323 days after the first day of the last menstruation.

Of the cases which come before the Courts, there are two main groups:

1. When the child is born out of wedlock.
2. When the child is born in wedlock.

In this short review, no attempt will be made to give the details of medicolegal cases, nor will a series of such cases be given. Examples of cases and the decision reached will be quoted in each subdivision of the two aforementioned groups.

I. CHILD BORN OUT OF WEDLOCK

(1) Bastardy, where the question of paternity is at stake.

(*a*) In the case of Duck vs. The State *(ex. rel. Dill 17 Ind., 210)*, the defendant offered to prove that relatrix had had sexual intercourse 322 days before the birth of the child with another person and the evidence was rejected.

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(*b*) In the case of Bosville vs. Attorney General, *(L. R. 12 Prob. Div. 177)*, the child was born 276 days after the mother left the husband. Here the child was found illegitimate by the jury.

In looking over these cases, it is easily seen that judges, juries and the medical profession vary greatly in their ideas as to the length of the gestation period. All one can do in such cases is to state what he knows to be the facts. Bessinger has reported a gestation period of 336 days, which is the outside limit of reported cases as regards protracted gestations. The fairly authentic case in England where a son was born July 7, 1781, and lived to maturity, and a daughter born January 5, 1782, or 182 days after her brother, and lived to marry, should warn us not to state that the gestation period for a viable child is six and a half months.

There are a great many circumstances which must be taken into consideration, such as the intermenstrual interval of the woman, heredity, the size of the child, etc., but usually not a great deal of stress is laid upon these in the courts. Day, in a report of 25 cases in private practice has noted that the longer the intermenstrual interval, the longer will be the gestation period, and in shorter intervals the findings were the opposite. It has been shown in some families that the gestations are longer or shorter than normal. Schickelé reported the case of a woman pregnant for the eleventh time, who could not understand why she was so large. Two hundred sixty-five days after the first day of her last menstrual period she was delivered of a child 57 cm. in length and weighing 5740 grams. He reported another case where the child was born 304 days after the first day of the last menstruation and was 49 cm. in length and weighed 2550 grams.

The words of T. Watts Eden make a very fitting conclusion. "Sufficient medical data have been accumulated to show that human gestation may be prolonged to a period of 336 calculated days, and there is nothing in the meantime to show that even this figure is the outside limit beyond which prolongation of pregnancy is impossible."

REFERENCES

Taylor: Principles and Practice of Medical Jurisprudence, London, 1910.
Virginia Med. Month., 1921, xlviii, 467.
Tidy: Legal Medicine, Philadelphia, 1882.
Witthaus and Becker: Medical Jurisprudence, New York, 1896.
L'article 315 du Code Civil, France.
Ann. de gynéc. et d'obst., 1906, lxiii, 396.
Maillart: Revue Médicale de la Suisse Romande, 1914, xxxiv, 268.
Schlichting: Arch. f. gynäk., 1880, xvi, 203.
Day: Boston Med. and Surg. Jour., 1920, clxxxiii, 686.
Schickelé, G.: Gynec. et Obst., 1922, v, 590.
Eden: Jour. Am. Med. Assn., 1921, lxxvii, 716.
Eden: Lancet, 1923, cciv, 1199.

BANDL'S RING AS A CAUSE OF DYSTOCIA, WITH A REPORT OF FOUR CASES*

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OPINION as regards the physiologic behavior of Bandl's ring in normal labor seems to be uniform. Similarly, authorities are generally agreed that the tendency of this structure to rise during the course of obstructed labor should be considered as significant of impending uterine rupture. On the other hand, there is a quite noticeable lack of unanimity in views concerning the rôle played by the ring of Bandl as a causative factor in the production of dystocia where marked disproportion between passenger and pelvis can be excluded. In consequence of these divergent views and the inconsistent and indiscriminate usage by many writers of the terms, Bandl's ring, contraction ring, and retraction ring, the whole subject has been needlessly confused and has failed to receive the consideration it rightly deserves.

White[1] designates as contraction ring a condition which he considers as being in no wise related to the ring of Bandl: namely, that it represents a localized spasm or contraction of circular muscle fibers, the site of which is dependent upon a point of diminished resistance such as is afforded by a depression in the fetal outline or below the presenting part. To support this view of localized uterine contraction, he cites the observation of Bar that the two tubes of the double uterus of rabbit need not contract simultaneously, and a like observation by Treub in the case of a double human uterus. However, he admits that the existence of localized uterine contraction apart from obstructed labor is doubted by such men as Herman and Veit.

Lochrane[2] is inclined to favor this view of local uterine spasm without definite retraction of upper uterine segment, but states that opinion is not unanimous. He records that Budin, Cheron, and Demelin have described such cases, and that Berkeley, Russell, and Fairbairn consider the condition as a definite clinical entity. Bumm[3] and von Rosthorn[4] believe that a contraction ring is evident on the inner surface of the upper segment in every case of labor before the onset of uterine contractions, and before retraction of any consequence has taken place. Veit,[5] however, is opposed to such a view, and his opinion is shared by Williams.[6] In substance, Veit claims that all such rings are true contraction rings, and that the views of Budin and others are the result of faulty observation.

*Read before the St. Louis Medical Society, March, 17, 1925.

In White's tentative differential diagnosis of dystocia due to contraction ring as he conceives it, localized spasm apart from Bandl's ring, and that due to retraction ring, Bandl, he places considerable emphasis on the relaxation of the upper segment and the absence of thinning and overdistention of the wall below the ring in the former condition, as opposed to tonic contraction of the uterine body, and thinning and overdistention of the lower segment which maintain in the latter. These facts, while recognized clinically, do not, it seems, presuppose or support the theory of localized contraction of circular fibers to the exclusion of tonic and isolated contraction of Bandl's ring. In this connection, Harper[7] has quite clearly described like signs which he attributed to tonic contraction of Bandl's ring.

Furthermore, in regard to White's belief that the depressed areas and irregularities of the fetal ovoid afford points of diminished resistance which predispose to localized uterine spasm or ring formation, it may be said that rings are observed in direct relation with one of the lesser fetal diameters almost universally. This does not seem, however, to be a factor in etiology, else multiple rings might be frequently encountered. On the other hand, it is not unreasonable to suppose that a preexisting ring, Bandl, which for some reason yet unexplained becomes endowed with increased and persistent tone, should come into apposition with the least fetal diameter accessible: the exact location depending equally upon the amount of retraction the upper segment presents at the time, and upon the extent of advance or station of the fetus in the birth-canal. Moreover, obliquity in position of the ring or variations in size and development in different segments of its circumference, as noted clinically, are dependent upon the opposed fetal surfaces. In other words, the site of the ring with relation to the fetus, the form and position which it assumes with relation to the vertical axis, and the extent of the development in the various segments of its circumference are in the final analysis all due to the same factors.

It is beyond the scope of this paper to deny the existence of localized uterine spasm, apart from Bandl's ring, as a causative factor of ring dystocia. The existence of such a phenomenon has been supported by careful observers, but the substantiating evidence seems far from convincing, failing as it has to convert the opinions of a number of eminent men, among whom may be mentioned Veit and Williams. On the other hand, a fairly extensive literature may be invoked to support abnormal behavior of Bandl's ring, and it seems not unreasonable to assume that by far the greater number of so-called ring dystocias are dependent upon Bandl's ring in perverted activity.

Of the American writers on this subject, Harper is the outstanding figure, and in view of his observations, together with the work of others, it seems that most clinical manifestations of labor obstructed by

rings may be attributed to a variation of behavior of Bandl's ring dependent upon the stage of advancement of labor and other factors. The ultimate etiology for this pathologic behavior is, of course, obscure. Harper recognizes two types of rings: (1) "A ring presenting persistent tone in the presence of general uterine retraction." Bandl's ring in such cases of dystocia may properly be called retraction ring, and together with the general uterine retraction, it is responsible for lack of advancement. (2) "A ring in tonic contraction in the absence of retraction of the rest of the uterus." In this instance the ring alone is responsible for the arrest. The name "contraction ring" should be reserved for this condition, and while Harper so employs it, he offers no objection to the various other designations so long as the clinical significance is not overlooked. However, adoption of the terms "persistent retraction ring of Bandl," and "tonic contraction ring of Bandl" to designate the respective clinical syndromes will accomplish much in placing the entire subject on a more rational basis.

In reviewing the literature on cases of dystocia variously designated as being due to retraction ring, contraction ring, and Bandl's ring, a number of interesting facts are noted. In addition to the four cases herewith presented, forty-three other cases are considered. These were reported by White, Harper, Jardine,[8] Alderson,[9] Armytage,[10] Hicks,[11] Lochrane, and Holzberg.[12] The cases reported by White represent a collection of cases, treated by cesarean section, and observed by various men, together with a number of his own cases.

STATISTICAL CONSIDERATIONS

Parity.—In a total of 47 cases, parity was mentioned in 44. Of this number 24 were multipara and 20 were primipara, about equally divided.

Age.—Of the multiparous patients, the age was recorded in only nine instances. The eldest patient was forty-one and the youngest twenty-five. The average age was thirty-three and four-tenths. Of the twelve primiparous women whose ages were given, the eldest was thirty-six and the youngest twenty-four, while the average age was twenty-nine and seven-tenths. It will be noted that ring dystocia is a complication most frequently encountered in the latter part of the third and early part of the fourth decades, while few instances in the first half of the third decade, and none of this series are in the second decade.

Pelvis.—Specific mention of the type of pelvis was made in 17 cases, while in the 30 remaining case reports the impression was gained that few instances of pelvic disproportion were met. Of the 17 cases, 14 were normal, 2 flat, and 1 generally contracted.

Presentation.—Presentation was recorded in 43 instances. Of this number, 28 were vertex, 9 transverse, 4 breech, 1 brow, and 1 face.

Of the vertex presentations no accurate conception could be gained as to the relative occurrence of anterior and posterior positions. It will be seen that the relative proportion of malpresentation is high.

Rupture of Membranes.—Early rupture of membranes is generally considered as a predisposing factor of some consequence in the production of this complication of labor; a contention which seems amply supported by the accompanying figures. The time of rupture of membranes with relation to the onset and termination of labor was stated in 24 case reports. In 8 of these 24, rupture occurred before the onset of labor, the time ranging from three days to one hour before onset. In 9 others rupture occurred early, and in the remaining 7, late. It will be observed that in 70 per cent of cases, rupture of membranes took place before onset or during an early stage of labor.

Character of Pains.—Concerning the character of contractions as to frequency, effectiveness, and the subjective pain experienced, the case reports were rather vague; in fact, no mention of these points was made in 33 cases. Of the remaining 14 cases, 12 had atypical labor pains, and 2 pursued an apparently normal course. In the 12 atypical cases the nature of the variation from normal was not clear in all instances. The two outstanding features were the presence of an increased subjective pain varying in its site, but most frequently described as being low in the back, and irregular, ineffectual contractions usually extending over a prolonged period of time.

Measures Employed to Expedite Labor.—Here reference is made to manipulations and other procedures employed early in labor with the purpose of hastening progress, but with no intent of effecting immediate delivery. In the entire series, this point was made clear in 25 cases. Twelve of this number were unmolested and allowed to pursue a natural course. In the remaining 13, oxytocics were employed in 4, hydrostatic bags in 3, digital dilatation of cervix in 3, traction on presenting part in 2 (breech and leg), and ineffectual external version in 1. It will thus be seen that calculated measures of expediency were employed in 52 per cent of cases. This figure would perhaps be higher if case records were more detailed concerning this particular phase, since several hands were often concerned in the treatment of these patients and a diagnosis established by a late consultation.

Unsuccessful Attempts at Delivery Before Diagnosis.—Concerning this matter, 23 reports are clear. In 11 instances diagnosis was made before or at the time of initial attempt at delivery. However, in 10 cases, unsuccessful forceps, in some cases repeated attempts, and in 2 cases, unsuccessful forceps and attempted version were employed before establishment of diagnosis. In other words, 52 per cent of patients were subjected to the manipulations attending operative delivery before the true cause for the dystocia was discovered.

Site of Ring with Reference to Child.—Mention of the ring's location was made in 19 cases.

Below presenting part,—4 cases or 21 per cent.
About neck,—11 cases or 57 per cent.
About thorax,—2 cases or 11 per cent.
About neck and shoulders,—1 case or 5 per cent.

Fetal Mortality.—Mortality figures were given in 40 case reports. Three instances of macerated fetus encountered in the group of patients treated by abdominal cesarean section were excluded, reducing the number to 37.

All Methods of Delivery

Living,—15.
Stillborn or died shortly after birth,—22
Mortality of 59 per cent.

Delivered by Abdominal Cesarean Section

Three cases of macerated fetus excluded.
Living,—13.
Stillborn or died shortly after birth,—9.
Mortality of 40 per cent.

Other Methods of Delivery Including Destructive Operations

Living,—2.
Stillborn or died shortly after birth,—13.
Mortality of 86 per cent.

Maternal Mortality.—Information relative to this point was obtainable in 40 cases. One eclampsia death in the cesarean group was excluded, reducing the figure to 39.

All Methods of Delivery

Living,—28.
Died,—11.
Mortality of 28 per cent.

Delivered by Abdominal Cesarean Section

Living,—16.
Died,—8.
Mortality of 33 per cent.

Other Methods of Delivery Including Destructive Operations

Living,—12.
Died,—3.
Mortality of 20 per cent.

Smith, quoted by White, reported a series of cases with a maternal mortality of 27 per cent and a fetal mortality of 83 per cent. Dickinson[13] concluded that one-third of the mothers and one-half of the children die. White, excluding laparotomy cases, found a maternal death rate of 38 per cent and fetal of 63 per cent, while in 18 cases

treated by section, the above figures were reduced to 31.5 per cent and 42 per cent respectively. White's cases are included in the figures of the present series.

While the number of cases upon which the accompanying figures are based is too small to admit of accurate conclusions concerning the method of management best adapted to these cases, some deductions seem permissible. In the face of an increased maternal mortality,

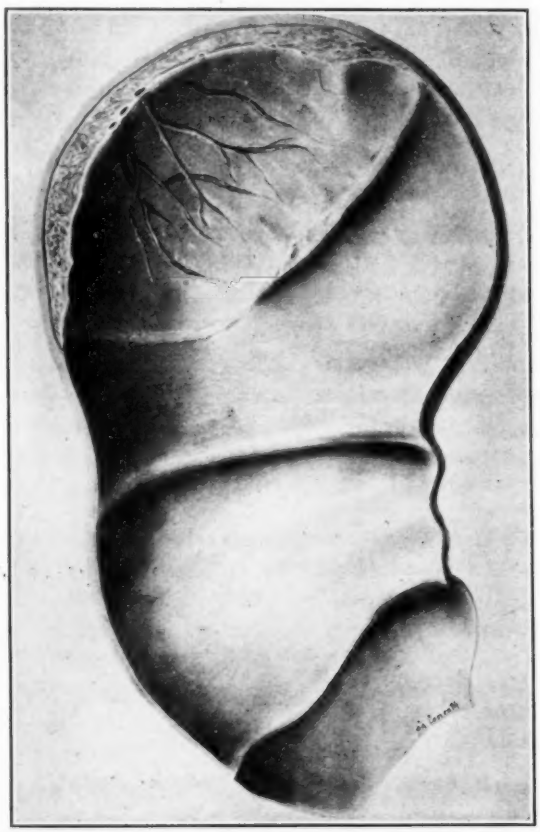

Fig. 1.—Showing left half of uterus removed at autopsy with fetus *in situ*, the contraction ring and attenuated lower segment, measuring 3 mm. in thickness.

even though the fetal mortality is lowered to a much smaller figure, abdominal cesarean section as a method of choice advocated by a number of British observers must give way to more conservative methods, granting, however, that section must occasionally be resorted to even in the presence of an increased risk. Furthermore, in view of the usual late recognition of the condition and the not unfailing signs and symptoms accompanying it, excepting those directly referable to the ring itself, early and careful exploration of the lower uterine segment in cases of unexplained dystocia is advocated.

CASE REPORTS

CASE 1.—A colored woman, aged thirty-four, in her second pregnancy at full term. Her previous pregnancy, fifteen years ago, terminated in a spontaneous abortion at three months gestation. Onset of labor March 19, 1922. Entered Barnes Hospital March 24, labor pains having practically ceased twenty-four hours previous to admission. Membranes ruptured shortly after onset of pains. Patient was under the care of a colored physician who had employed pituitary extract (amount not ascertained) and who had attempted instrumental delivery without avail the night of March 23, 1922. She was then seen by a second physician who referred her to the hospital, suspecting either twin pregnancy or monstrosity.

On entry she was in a state of exhaustion, temperature 38.5° C., pulse 110, and respirations 36. There had been no bowel movements or passage of urine for two days. A foul-smelling vaginal discharge was present. The abdomen was peculiarly shaped and full, especially above the umbilicus; bladder distention was also present. Small parts could be felt on the left and breech identified in the fundus. Fetal heart sounds absent. Vaginal examination showed the parts edematous and lacerated. There was a large caput over the vertex which was entering the pelvis in R. O. T. There was considerable overriding of the anterior (left) parietal bone. Craniotomy was decided upon. Under ether anesthesia, the skull was perforated and a cranioclast easily applied, but failed to hold. Both arms were brought down and partially amputated. The cranioclast was again applied but delivery could not be effected. At this juncture, respirations ceased. Postmortem it was found that a tetanically contracted ring prevented dislodgment of the presenting part upward, and also prevented passage of the hand to fundus. Fetus *in utero* was removed at autopsy. The true conjugate measured 10 cm. (Fig. 1.)

CASE 2.—Colored woman, thirty-six years old, gravida ii, having passed through a normal pregnancy to full term. She presented normal pelvic measurements. First pregnancy seventeen years ago, terminated early by criminal abortion, followed by profuse bleeding which necessitated curettage. Entered Barnes Hospital June 21, 1922. Membranes said to have ruptured before admittance. She was having weak, irregular contractions which soon stopped. Vertex presented as R. O. P. The cervix was high up posteriorly and closed. Uterine contractions again started in the morning of June 23. At this time the vaginal portion was of "paper thinness," and the cervix was represented by a small dimple, undilated. A finger was introduced and the margins readily dilated. Irregular, weak contractions continued throughout the day. Pituitary preparation, ♏ iii, was administered twice during the day to stimulate the sluggish uterus. Increase in dilatation was slow and the cervical margins became quite edematous. After eighteen hours, with 8 to 9 cm. cervical dilatation, the patient was anesthetized with chloroform and the cervix dilated manually. This was accomplished very readily and there was no apparent disproportion between fetal head and pelvis. On attempting to dislodge the head from the pelvis, with the idea of performing a version, a distinct ring was palpable about the neck of the child. Only a single finger could be passed between the neck and the ring, and there was no perceptible relaxation under deep chloroform anesthesia. Abdominal cesarean section was performed five hours later. Some difficulty was experienced in extracting the head through the ring, but incision was unnecessary. Convalescence was rather stormy for four days and aside from slight infection of the abdominal wound, which healed readily, the postoperative course was uncomplicated. Living child—3630 gm.

CASE 3.—This case was observed by J. D. James of Springfield, Mo., and the following report is given in his own words. "White, aged twenty-five, weight 150 pounds. Past and family histories negative. Last menstrual period January 11, 1922. Onset of labor Nov. 2, 1922 at 2 P.M. Membranes ruptured at this time. Pains very slight until 11 A.M. the following day, at which time vaginal examination showed the cervix to be 4 cm. dilated. At midnight, the pains became much stronger and examination revealed a fully dilated cervix and head in L. O. P., not engaged. By 2 A.M. Nov. 4, there was no advancement and patient was given 1 c.c. of pituitrin, after which pains became very severe but the head failed to advance. Forceps were applied to the nonengaged head but failed to deliver, only pulling the head down to the midplane. Later, version was attempted, one foot being brought down beside the head, the latter being apparently engaged and impossible to dislodge. I was first called at 6 A.M. Nov. 4, and found cervix fully dilated, head fairly well engaged, and one foot down. The foot was replaced with much difficulty and in so doing a contraction ring about 5 cm. wide was noted just above the internal os or continuous with the os. Anesthesia was deepened in the hope that the contraction ring would give way. The head was rotated manually to L. O. A., and forceps carefully applied slightly above midplane, but failed to deliver. Another examination was made with the whole hand, and ring was still present and tetanically contracted. It was impossible for me at any time to get my hand past the head into the uterus, or to palpate fetus beyond the middle of the left clavicle. I personally feel that this ring was the sole cause for the dystocia, and from the history it would seem that it assumed the pathologic rôle after version was attempted or at time of introducing hand into uterus, and that it was surely aggravated by forceps application. It was apparent that the uterus would soon rupture. On inspection of the abdomen it looked as though there might be twin pregnancy, or a band tied about the uterus; in other words, apparently two masses. A Porro operation (supravaginal hysterectomy) was advised inasmuch as the body of the fetus was tightly encased in the uterus with this firm contraction ring which, we felt, would surely cause rupture if an embryotomy or internal manipulations were attempted. Bloody fluid was found in the peritoneal cavity. In lifting the uterus out of the pelvis, rupture occurred just above the ring. The child was known to be dead at 4 A.M. The mother died Nov. 8, from ileus and acute toxemia."

CASE 4.—White woman, aged thirty-three years, gravida x. Her first four pregnancies resulted in miscarriage at six to seven months' gestation. Fifth pregnancy went to full term, had a "transverse presentation," became "unconscious" after three hours of labor, and was then taken to a hospital and cesarean section performed. Has had four full term children since; uterine inertia on second last following a labor of eighteen hours. Present pregnancy normal. Pelvis normal. Had four-plus Wassermann in November, 1921, and has been under antisyphilitic treatment the past year. General physical examination negative except for cardiac extrasystoles and small ventral hernia through old operative scar.

Entered Barnes Hospital Nov. 23, 1922. On Nov. 30, and the day following, a watery vaginal discharge was present (liquor amnii). On this latter date she had a few weak contractions at intervals of one-half hour. The discharge was still noticed on Dec. 2, and at 10 P.M., contractions characterized as extremely painful began to recur at intervals of three minutes. Vaginal examination showed complete cervical dilatation, small forewaters, sagittal suture in right oblique, and head movable at inlet. In view of patient's ventral hernia and

uterine scar, together with normal pelvic measurements, it was felt that version as a means of eliminating the strain of the second stage of labor was the preferable mode of delivery. On attempting to dislodge the head upward, a contraction ring was found about the neck, three fingers could be passed between the neck and ring. Under deep chloroform anesthesia and massage of the ring, sufficient relaxation was obtained to displace the sharply flexed head upward and to complete the version without much difficulty. The ring completely encircled the uterus slightly above the internal os, and while it relaxed under anesthesia and massage, it did not disappear. Child living, Wt. 3150 gm. Afebrile and uncomplicated puerperium.

CONCLUSIONS

1. White's conception of contraction ring does not seem tenable.

2. Adoption of the terms, "persistent retraction ring of Bandl" and "tonic contraction ring of Bandl," is suggested; the former applying to cases where, in addition to the ring, general uterine retraction is present; while in the latter, Bandl's ring alone exhibits contraction. The view of Dickinson that the two conditions may represent separate stages of the same process is worthy of consideration and is not improbable.

3. Cesarean section as a mode of delivery advocated by a number of British observers carries a high maternal mortality. The usual considerations relative to potential infection should govern the choice of this operation, granting that exceptions must be made as individual cases may demand.

4. Entirely apart from the consideration of infection, which in itself is ample reason, unnecessary vaginal examinations and other manipulations should be avoided in the conduct of normal labor.

5. Success in management, in the words of Harper, depends on "early recognition, early disappearance, and early application of conservative methods of delivery." "Early recognition" presupposes early exploration of the lower uterine segment.

REFERENCES

[1]White: Clin. Jour., London, 1913, xlii, 33. Brit. Med. Jour., 1916, ii, 752.
[2]Lochrane: Brit. Med. Jour., 1920, i, 11.
[3]Bumm: Quoted by Lochrane.
[4]von Rosthorn: Quoted by Lochrane.
[5]Veit: Monatschr. f. Geburtsh. u. Gynäk., 1900, xi, 493.
[6]Williams: Text Book of Obstetrics, ed. 4, 1917, New York, D. Appleton Co.
[7]Harper: Am. Jour. Obst., 1913, lxviii, 640. Am. Jour. Obst., 1916, lxxiii, 15. Surg., Gynec. and Obst., 1922, xxxv, 198.
[8]Jardine: Lancet, London, 1913, ii, 998.
[9]Alderson: Jour. Obst. and Gynæc. Brit. Emp., 1913, xxiv, 218.
[10]Armytage: Jour. Obst. and Gynæc. Brit. Emp., 1914, xxvi, 47.
[11]Hicks: Brit. Med. Jour., 1916, ii, 515.
[12]Holzberg: Jour. Am. Med. Assn., 1921, lxxvi, 1654.
[13]Dickinson: Surg. Gynec. and Obst., 1910, x, 377.

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A SERIES OF DEATHS IN GYNECOLOGIC PATIENTS

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A FEATURE of the weekly conference of the Woman's Hospital surgical staff is the presentation of casualty reports which include mistaken diagnoses, infections, complications, and deaths. The last item in particular is discussed in exhaustive detail and from these reports valuable suggestions as to the handling of future similar conditions are often brought out.

There can be no doubt that the case which results in a fatal outcome gives rise to more profound consideration and is often more instructive than the one which progresses smoothly to an uneventful recovery. The purpose of this study is, therefore, to determine what factors operating in these fatal cases were entirely beyond the surgeon's control and whether the patient's course might conceivably have been altered by him had the case been considered somewhat differently. The cases reviewed include 200 deaths on the gynecologic service and cover approximately 13,000 admissions. A great majority of these are in patients on the public wards although a few scattering private cases are included. This review does not consider the deaths of patients cared for by the courtesy surgeons and also omits both maternal and infant deaths on the obstetric service.

Table I

Age of Patient

UNDER 30	31 TO 40	41 TO 51	51 TO 60	OVER 60
30	31	85	24	30

Of the 200 patients under consideration all but ten underwent some sort of operative interference, although the procedures varied in extent from the intrauterine insertion of radium element under gas up to long traumatizing laparotomies under ether, consuming in some instances nearly three hours. The operations were performed by twelve surgeons, most of whom are members of the present visiting staff. A few of the simpler cases were done by the house surgeons under the close supervision of the visiting surgeons. The operating room technic and the preoperative preparation of patients are standardized here, making these factors practically identical for all the cases included.

The youngest of the patients was twenty-two years and the oldest seventy-four, while the average age of the group was forty-one. Age, therefore, bears about the same relation here as it would in

a group of successfully operated patients and does not appear to be an important factor in the reckoning of the details.

Colored patients made up only twenty-seven of the group, approximately one-eighth of the total. This may possibly indicate that they are possessed of higher resistance, as they make up about one quarter of the complete ward census and consequently might be expected to furnish a like proportion of the mortality list. This is contrary to the prevalent idea of the higher susceptibility of the colored races to disease in general and, in view of the relatively small number of cases considered, should probably be disregarded.

All cases were carefully studied before operation according to the hospital routine, except those upon whom emergency procedures were done. In addition to this many of them had been under treatment in the out-patient department for several weeks or months before entering the hospital. Most patients who presented any problems of diagnosis had the benefit of consultations by other members of the staff. The average stay in the ward before operation was nearly a week and often it was considerably greater than this when there were fever or other symptoms warranting it. Notwithstanding the diligence with which preoperative study was carried out, mistakes did occur in some instances from failure to secure enough laboratory or other data and detrimental procedures which might have been delayed or even omitted were performed.

The general physical make-up of these patients was distinctly below that of the average type coming into the hospital. A majority were underweight while many others were correspondingly obese and presented the general picture associated with poor operability. About twenty of them might be designated unquestionably as acutely and severely ill of fulminating inflammatory disease, or of hemorrhage, while three were described by those who compiled their histories as *in extremis*. A number also presented the cachexia of advanced cancer.

Judgment as to the operability of a given case can often be condemned in a study of such a series but the surgeon who is handling the situation is in a far different position than the reviewer who has all the subsequent data before him and who knows the final outcome. A complete and accurate diagnosis in a given case is naturally always a valuable asset in outlining a proper course of treatment although it may not have a uniformly proportionate bearing on the result obtained. Although every case considered showed a fatal outcome, still the diagnosis made was an accurate one in all but about 12 per cent of the series. The approximate reckoning is given, as in some of the cases recorded as mistakes, the operator was partially right in his diagnosis.

The diagnoses on the various patients showed a large plurality of

fibromyomata, many of which were associated with extensive adhesions which rendered operation technically difficult and time-consuming on account of their inaccessibility. They make up a total of seventy-one cases. Next in rank were patients in whom inflammatory disease of the adnexa and contiguous structures constituted the outstanding lesions. There were thirty of these. There were twenty-one cancer cases, some of which received only radium and others of which underwent long laparotomies for corporeal or ovarian malignancy. A similar number of patients, twenty-one, needing plastic operations are included, the group being made up of procidentias and various types of pelvic floor, cervical, and anterior vaginal wall lacerations. Next in order of frequency were twelve adherent retroversions and ten ovarian cysts, three of which had twisted pedicles. There were three cases of uncomplicated retroversion and twenty-five unclassified cases, that presented a combination of lesions or some condition not strictly gynecologic, such as postoperative ventral hernia, inoperable carcinoma of the breast, kidney lesions of various types, abdominal pregnancy, acute cholecystitis in combination with a minor pelvic condition, and several cases of therapeutic abortion for toxemia of pregnancy.

TABLE II

TYPES OF OPERATION

LAPAROTOMIES	PLASTICS	COMBINATIONS	RADIUM	MISCELLANEOUS	NONE
162	2	13	3	8	12

Patients who were not operated upon at all numbered 12 and of these four died of sepsis following induced abortion done elsewhere. There were two cases of pyelonephritis, one of which was in a single remaining kidney. The other pyelitis subject entered for an ovarian cyst operation but her kidney lesion proved to be the feature of her case. She was in a tolerably good condition on admission but gradually failed. This seemed to us a rather remarkable case as we usually encounter pyelitis as a rather mild complication, in gynecologic work, that yields readily to treatment. There were three general carcinomatosis deaths in unoperated patients, two of whom had pleuritic effusions, probably metastatic processes. There were two cases of general peritonitis which arose from an appendix abscess and a diverticulitis respectively. The last case of the twelve unoperated was a ruptured ectopic pregnancy patient who expired just as blood transfusion was being undertaken.

All the remaining patients had operations of one kind or another. There were 162 laparotomies alone, among which are those patients who had vaginal hysterectomies and in whom the peritoneal cavity was entered from below. There were thirteen patients who had both plastic and abdominal work done while two had plastic work alone.

Of the latter, one was for repair of rectocele and the other for rectocele and cystocele. It is significant that but two deaths occurred in patients who had only plastic operations in a series which covers nearly 13,000 hospital admissions. The proportion of plastic work done at the Woman's Hospital is naturally high and much of it is the fascia lapping variety which requires accurate, time-consuming work. This would tend to show therefore, that time element is not so important a factor in plastic work as it is elsewhere and the resistance to infection is considerably higher when the peritoneal cavity is not entered, whether it be from above or from below. Both the plastic cases died of pulmonary embolus after making good early recoveries. There were three cases of irradiated cervical cancer and eight other operations of various types including nephrectomies, breast amputations, induction of labor, and Percy cauterization for carcinoma.

The average operating time in the patients who had abdominal work or a combination of abdominal and plastic work was one hour and forty minutes. This is from thirty to forty minutes higher than the usual gynecologic case which does well. Many of the patients were on the table from two to two and a half hours while the longest case was a Mayo vaginal hysterectomy with repair of a large rectocele which consumed exactly three hours. It is quite likely that these patients would have fared better from the standpoint of infection had the operations been shorter since the attendant shock consequent upon long manipulation of peritoneal structures may have been a factor in lowering resistance.

TABLE III

CAUSES OF DEATH (CLINICAL DIAGNOSIS IN ABOUT 80 PER CENT)

INFECTION 1. PERITONITIS 2. SEPSIS 3. BOTH	PNEUMONIA	HEMORRHAGE	CACHEXIA OF CANCER	EMBOLISM	UNCLASSIFIED OR OBSCURE	ANESTHESIA	SHOCK
117	7	7	13	11	20	5	20

Autopsies were obtained on approximately one in six cases of this series, a fact which might appear to render the actual cause of death more or less speculative in a great majority of cases. This, however, is not the case as the clinical picture in nearly all of them is a pretty clear cut one and leaves very little to be supplied. A surprisingly large number of these patients died of infection which, at first local, went on subsequently to general sepsis. This is contrary to the prevalent conception that death in long traumatizing abdominal operations is often due to shock. It is doubtful if there were more than a dozen cases of pure shock in the series as only ten of the patients died within twenty-four hours of leaving the operating table. To

be sure there were large elements of shock in many of the patients but it seldom appeared to do more than to lower their resistance to subsequent infection.

In this connection it would seem from careful study of the individual histories that the infections arose largely from latent organisms,—staphylococci, streptococci, and bacillus coli,—which were liberated with the separation of intestinal adhesions, especially those about the sigmoid and rectum, in endeavoring to mobilize tumors or inflammatory masses deep in the pelvis. Again and again operators describe the difficulties attendant upon the manipulation of sigmoid adhesions although the gut was actually entered to gross inspection in but three cases of the series. This does not appear to be necessary for the liberation of organisms, it being obviously the serosa of the gut which acts as a barrier to further extension of microorganisms. It is very likely that a great majority of these patients who died after twenty-four hours but within ten days were cases of general sepsis, although an organism was but rarely obtained from the blood stream. It is noteworthy also that, notwithstanding the prevalence of gonorrheal infection in the pelvic organs, in only one case was the gonococcus cultured from the peritoneum and this was in a case so acute that there was a question of differential diagnosis between adnexal disease and appendicitis.

This group of cases does not bear out the teaching theory of the special danger of thrombus formation in the pelvic veins after gynecologic operations. Only ten patients showed true embolic deaths, one thirty-two days after operation. This averages little, if any, higher than is found in general surgery.

The scheme of study of these patients included a survey of their general physical make-up at time of admission, the length of observation in the out-patient department, and their hospital course as regards fever, blood pressure, various diagnoses, and laboratory findings. The operation was considered from the standpoint of the kind of anesthesia, duration, amount of hemorrhage, trauma and technical difficulties encountered, and the organisms obtained at time of operation. The postoperative course, treatment, and autopsy findings, if any, were also reviewed.

TABLE IV

DAYS LIVED AFTER OPERATION (OR AFTER ADMISSION IN UNOPERATED CASES)

2 OR UNDER	3 TO 6	7 TO 10	OVER 10
28	90	49	33

The accompanying tables present graphically the more important phases of the cases studied. It will be seen that our patients lived from a few hours up to more than eight weeks following operation.

A vast majority of them succumbed between the third and the eighth day, the average number of postoperative days being approximately five.

The methods of postoperative treatment instituted in the cases were almost entirely symptomatic and supportive. Various preparations of digitalis, strychnine, camphor, pituitary and suprarenal extracts were the drugs most frequently employed while gum glucose solution was injected intravenously and blood transfusion done in a number of cases. The percentage of unsatisfactory results obtained from the use of symptomatic treatment alone brings to mind the desirability of a specific remedial agent, chemical or serologic, to combat the infection which is so often present in these cases. The good results recently obtained by various observers with mercurochrome and other bactericides and the successful application of serum therapy to puerperal sepsis would seem to indicate definite progress along this line.

SUMMARY

1. Age appears to have but slight bearing on operative risk of gynecologic patients. This series seems to put operative resistance of colored patients somewhat higher that that of whites.

2. The general physical make-up of patients rates very high in determining the advisability of operation. Hospital residence previous to operation is undoubtedly insufficient on the average. Underweight, anemia and general asthenia should be thoroughly cared for by long rest either in hospital or in some cases in the country. Blood transfusion as a prophylactic measure should be freely used.

3. Long anesthesia is in itself without doubt a factor in lowering resistance and thereby heightening susceptibility to infection. So long as speed in operating is compatible with gentleness and accuracy it should be encouraged.

4. The surgical patient who dies after twenty-four hours and within a week to ten days will frequently show peritoneal infection and probably will have varying degrees of bacteremia. Infection was demonstrated several times at autopsy in this series where the classical signs of hectic fever, leucocytosis, etc, were absent.

5. The separation of extensive intestinal adhesions, especially about the sigmoid and rectum, in myoma operations, repeatedly resulted in subsequent peritonitis even where there was no visible gut injury. The danger of this procedure appears to be extremely high if this series of cases is a criterion.

6. Although gonorrhea is admittedly a widely debilitating affection, it was definitely fatal in only one patient of this series so far as we were able to prove.

7. There appears to be a definite need for more thorough and systematic care of patients who have undergone long traumatizing opera-

tions. Present methods are without tangible effect on peritoneal infection and its sequelae.

8. Long, technically difficult operations for tumors are often attended with varying degrees of hemorrhage and shock, thereby encouraging infection. In some of these cases it would appear that radiotherapy had better been considered more seriously.

9. Pure shock was but rarely a cause of death. Mild shock was very often a contributing cause.

10. The wisdom of routine appendectomy is to be questioned where much time has already been consumed and where the organ is inaccessible and necessitates much dissection for its removal.

11. Deaths from embolism, advanced cancer, and occasionally hemorrhage are inevitable and a practically irreducible quantity. It is conceivable, however, that the mortality in gynecologic work, low as it is, is subject to still further reduction among the large group of patients who succumb to infection following operations for extensive inflammatory disease and adherent tumors.

While the operative mortality (approximately 1.5 per cent) of all patients at the Woman's Hospital compares very favorably with similar reports from other clinics, still it is naturally one of the chief aims of the staff to see this rate further lowered. There has been definite progress along this line with a fractional decrease in the figure each year.

114 East Fifty-Fourth Street.

Department of Maternal Welfare

POSTGRADUATE INSTRUCTION IN OBSTETRICS

IN the process of furnishing better maternity care it is essential that appropriate standards be adopted for the teaching of this branch of medicine, not only in our medical schools, but among the mass of medical practitioners. There is no single field in which practical teaching is as much required as in that under discussion. Unfortunately in the past, and even under present circumstances, many medical schools do not furnish sufficient practical training to their students. The growth of maternity hospitals and maternity services in general hospitals has, however, increased the possibilities and opportunities for such teaching. In so far as postgraduate study is concerned, there are now being developed in many of the larger centers of the country such opportunities in leading hospitals and clinics. The subject has been actively studied by the Committee on Medical Education of the New York Academy of Medicine, which has prepared synopses and approved courses of study in New York City, including obstetrics and gynecology. Further information regarding these may be obtained from the Executive Secretary, Dr. Frederick P. Reynolds, 17 West Forty-third Street. Two extended courses are given at the Lying-In Hospital and a course of instruction on the manikin is announced at the Post Graduate Medical School. Several of the Brooklyn hospitals also announce extended courses for practitioners and students, the details of which may be obtained from the special circular issued by the Academy of Medicine.

This is a very satisfactory beginning in a movement that should receive wide attention by those in a position to provide postgraduate instruction in obstetrics. Increasing knowledge will develop in an individual a greater respect for this important branch of medicine, for which in former years it was necessary for the prospective student in many cases to attend European clinics. The development of such facilities in the United States not only reacts on those immediately benefited but also on the institutions, for it is a well-recognized fact that hospitals and clinics associated with the teaching of medicine invariably obtain excellent results for their patients.

THE MATERNITY CENTER OF THE ORANGES

A Community in the State of New Jersey

SEVERAL years ago an effort was made to systematize the prenatal work in this community group which is located practically within the Metropolitan District of New York City. Of the seven different organizations doing prenatal work all had different methods

and ideas and gave out varying instructions to patients. A maternity center was organized and the work of the various hospitals and nursing organizations was brought together under the charge of a committee of three. The work is now divided between clinics and a field nurse, the latter provides for observations of patients who cannot make regular visits to the clinic on account of the distance. In addition to the nurse's visits, the patient is examined by a physician in a regularly established clinic. No patient who has a private physician is given prenatal care without the latter's consent and no patient who can afford a physician is referred to a hospital for confinement unless abnormal conditions are found, and then only after due consultation with the physician in charge.

During the year 1924 this center looked after over 1000 patients and made almost 5000 visits. There were 780 deliveries of which 105 were abnormal. Five hundred and sixty-four of the women were delivered at home and 216 in the hospital.

The above is an excellent demonstration of cooperation between a quasi-public agency and the private practitioner. The service has been developed by cooperative means in which the medical profession has taken the lead and continued to assume an important directing function.

MATERNAL WELFARE ACTIVITIES IN ESSEX COUNTY, NEW JERSEY

AN extended and satisfactory program is being developed by the Medical Commission for Maternal Welfare of Essex County, N. J. This commission was organized by the Essex County Medical Society in May, 1923, and maintains an official relationship to the parent society. A number of very useful and praiseworthy developments have resulted from the activities of this commission. In order to encourage the keeping of records of obstetric cases, blanks have been offered to physicians of the county for their private practice. The commission has likewise undertaken to publish concise and authoritative pamphlets from time to time relating to maternal welfare, and stated meetings are regularly held for the discussion of obstetric topics.

The above is an organized effort which should be widely followed, in which the initiative is taken by the medical profession. In the resolution endorsing the commission, the Essex County Medical Society directed that efforts be made to coordinate the various public and private agencies engaged in the attempt to reduce maternal mortality and that it establish standards for prenatal, delivery and postpartum care; that it concentrate its efforts to increase the efficiency

of health departments, hospitals, physicians, nurses and midwives, and that finally, it should keep the public informed of the progress in this field by periodical publications.

POSTGRADUATE LECTURES IN OBSTETRICS FOR RURAL COMMUNITIES

THE question of improved obstetric care for the women of the rural districts has been given a great deal of attention by the Division of Maternity, Infancy and Child Hygiene of the Department of Health of the State of New York under the immediate supervision of its Director, Dr. Florence L. McKay. The following program has been given in St. Lawrence and Jefferson Counties recently, with an average attendance of about fifty physicians: Dr. John O. Polak, of Brooklyn, N. Y., lectured on "Prenatal Care and the Pathology of Pregnancy"; Dr. Francis Goldsborough, Buffalo, on the "Pathology of Pregnancy"; Dr. Harold Bailey, New York, on the "Pathology of Labor and Postpartum Care," and Dr. James K. Quigley, Rochester, on the "Management of Normal Labor." The favorable reception which has been accorded to these lecturers should serve as an incentive to have them copied in other states. A synopsis of these lectures follows:

OBSTETRIC LECTURES

Lecture I. *Prenatal Care.*

1. The history and importance of records, especially pelvic measurements, routine urinalysis and blood pressure findings and later diagnosis of position, presentation, evidences of disproportion, fetal movement and heart observations.

2. Complete physical examination as outlined in Standards of Maternity Care, stressing the importance and meaning of pelvic measurements, blood pressure and complete urinalysis. Demonstration of physical examination. Also hyperthyroidism; prophylactic treatment, especially in localities where this exists.

3. Instruction in matters of hygiene; distribution of literature. The public health nurse. Description or demonstration of a full prenatal nursing visit.

4. Return visits; their purpose; observations necessary.

5. Final examination before delivery to determine position, engagement, etc.; when and how it should be made and what to look for; demonstration.

6. Prevention of sepsis. Time for vaginal examination.

Lecture II. *The Management of Normal Labor.*

1. Equipment, minimum and maximum.
2. The sterile obstetrical package.
3. The arrangement of equipment.
4. The preparation of the field.
5. Preparation of doctor and nurse.
6. Use of the abdominal binder.
7. Use of rectal examinations.
8. Analgesia and anesthesia.

9. Management of the second stage.

10. Indications for interference and its effect on the mortality and morbidity rates of mother and infant.

Lecture III. *Postpartum Care.*

1. Routine care, from time of delivery. Prevention of hemorrhage and infection. The exercises that are useful, and when to employ them. The need for return visits on certain days. Importance of examinations at two and six weeks—vaginal.

2. Hemorrhage; treatment.

3. Sepsis. Prevention. Early symptoms and treatment.

4. Care of nipples. Treatment of sore or fissured nipples.

5. Care of the newborn child. Examination. Retraction of the foreskin, and after-care. The care of weak, injured, or premature babies. Hemorrhagic caputs. Treatment. Hemorrhagic disease; early diagnosis and treatment.

6. Breast feeding; its importance; its relation to infant mortality; methods of establishment; maintenance.

7. Artificial feeding; indications and approved methods.

Lecture IV. *The Pathology of Pregnancy.*

1. Miscarriages and premature labors. Causes and prevention.

2. Extrauterine pregnancy. Diagnosis.

3. Varicose veins; hemorrhoids; "right-angle position."

4. Vomiting; types and treatment.

5. The toxemias. Early symptoms, diagnosis, treatment. When is interruption of pregnancy justified?

Lecture V. *The Pathology of Pregnancy.*

1. Placenta previa. Diagnosis and treatment.

2. Hydramnios.

3. Multiple pregnancy.

4. Tumors.

5. Malpositions; their treatment before onset of labor.

6. Contracted pelves. Types and diagnosis—signs of disproportion.

7. What cases should have hospital care?

Lecture VI. *The Pathology of Labor.*

1. Dry labor.

2. The management of breech, tranverse, and face presentations. Occiput-posterior positions. Prolapsed cord.

3. Forceps. Indications and technic.

4. Version. Indications and technic.

5. Ruptured uterus. Symptoms.

6. The use of pituitrin. When it may be safely employed and in what dosage.

7. Premature separation of the placenta. Diagnosis.

8. Indications for cesarean section.

Society Transactions

THE NEW YORK OBSTETRICAL SOCIETY

MEETING OF MARCH 10, 1925

THE PRESIDENT, DR. REGINALD M. RAWLS, IN THE CHAIR

DR. ELIOT BISHOP reported a case of **Second Pregnancy after Severe Toxemia.**

The record of the first pregnancy showed a desperately ill patient developing, antepartum, marked arterial hypertension with albuminuria, edema and visual disturbances. Induction of labor at the eighth month produced an unpromising baby who, however, is now a sturdy child of three.

Postpartum, the patient developed again, hypertension, albuminuria, tachycardia, and vascular changes in the brain, retina, kidney, heart muscle and veins, causing blindness, coma, hemiplegia, myocarditis, and double saphenous phlebitis. In spite of this heavy burden, the patient slowly but surely returned to normal health. A quite natural criticism was, that labor was too long delayed.

As she was the friend of a well-known surgeon in Brooklyn, and personally known to several members of this society, there was an active interest in her case, and last summer when she became pregnant again, there was grave concern. The internist and the ophthalmologist surveyed her critically and could find no scars of her previous lesions, and the usual laboratory examinations substantiated the clinical review. It was determined to await developments. She continued, with no unusual signs or symptoms, for about eight months, when a trace of albumin appeared and the blood pressure went to 136. She was admitted to the hospital the next day, and there the slight hypertension and albuminuria disappeared. However, after a few days, labor was started with quinine and castor oil, and she had a baby of nearly seven pounds, followed by an uneventful puerperium.

This case is reported, obviously, for no interest *per se*, but to demonstrate these points:

1. The relativity of obstetric toxemia:
2. The regenerative power of parenchymatous tissue:
3. Possibility, under strict and individualized study of the safety of pregnancy after even the most severe toxemia.

DISCUSSION

DR. A. B. DAVIS.—With these findings, I would have hesitated to allow this patient to continue her pregnancy as I believe her eyesight was jeopardized. After the usual toxemia of pregnancy we not infrequently see partial or total blindness, with rapid and complete restoration of vision as soon as the toxemia is overcome, either by termination of pregnancy or by treatment. In these cases blindness is due to edema, without structural change in the eye. In patients who have died from eclampsia, the autopsy findings are nearly uniform. There are always well-marked hemorrhages and destruction of tissues in the liver; hemorrhage in the brain, and patients who had not suffered from previous chronic nephritis,

all showed acute parenchymatous congestion. It is my opinion that the kidneys are peculiarly tolerant of the poisons excreted through them in pregnancy. Permanent injury to their structure is a late manifestation. I believe it is unsafe for a woman who has ever had retinal hemorrhages to become pregnant again. The risk of partial or total blindness is too great. We have repeatedly seen cases recover from eclampsia and later bear one or more children. In some, the signs of toxemia are detected early and successfully treated, allowing the pregnancy to go on to full term. There are other instances where toxic symptoms are not manifest in subsequent pregnancies. I recall one such case. The patient was brought in on the ambulance, about six months' advanced in her first pregnancy. She was edematous, in complete coma with convulsion after convulsion in rapid succession. Her condition was apparently hopeless. The uterus was promptly emptied by vaginal hysterotomy and packed. No attempt was made to close the uterine wound by sutures. Since then, this patient has been delivered of two full-term children, and has had one early abortion which was induced by a severe fall. In these latter pregnancies there were no signs of toxemia. I believe that this case is particularly instructive. The patient had continued to work hard in business after marriage and during her first pregnancy. After recovering from the eclampsia, she moved to the suburbs, where she lived an easier and more wholesome life. I think that the fatigue during the first pregnancy was a factor in the development of toxemia.

DR. HAROLD BAILEY.—It is rather interesting, I think, to consider the treatment of these cases that have had eclampsia and I have been much impressed with Dr. Caldwell's work in following up the cases that he has already studied and comparing the blood chemistry with the reports at the time of the previous eclampsia. As I remember it, seven of the dozen cases which he followed had normal pregnancies following the eclampsia. However this is not true in all cases; the other day we had a women who had eclampsia two years ago. She came in with a blood pressure of 190 and 2-plus albumin. Six hours after admission she had four convulsions. She was treated with morphine and bloodletting and recovered. A week later we induced labor and obtained a living child that died in three days. This is a case that recurred and that was apparently of the typical eclamptic and not of the nephritic type.

DR. W. E. CALDWELL.—I do not know of any physical sign at the time of the attack that would make it a positive indication for the interdiction of future pregnancies.

We have had cases with hemorrhages in the retina and practically all the serious symptoms in which the patients recovered and a few of them went through like Dr. Bishop's case.

In the majority of these cases we have been concentrating lately on the infections,—such as tonsillitis or an acute cold. The follow up after those attacks, the manner in which they clear up, the way that they act between their pregnancies, I should think would be of a great deal more value than any physical sign that we find during the attack and we cannot be sure then that we will not stir up the case again.

DR. HERMAN GRAD reported a case of **Rupture of the Uterus Following Breech Extraction.**

The history of this case dates back about three years, when the patient consulted me on account of her sterility. She was twenty-five years old, and had been married four years.

On examination, a tumor was found in the pelvis, which was considered to be a fibroid of the uterus, the size of a large apple, movable, apparently pedunculated. The cause of her sterility was not ascertainable. Examination of semen showed active and abundant spermatazoa.

Nothing was heard of the patient until two years later, when she presented herself at the office, about four months' pregnant. Examination showed that the neoplasm was in the pelvis, blocking the cavity. The tumor appeared to be slightly enlarged, somewhat tender to the touch.

The patient was told that two methods of procedure were open to her: the first, an immediate myomectomy, with the possibility of miscarriage: the second, a cesarean section at term. She was also told that it was possible for the tumor to become raised out of the pelvis, and delivery affected by the natural passage. The patient declined operation and decided on a cesarean section at term, should the tumor fail to rise out of the pelvis.

During the latter part of the sixth month, the tumor began to rise out of the pelvis. By the end of the seventh month, the pelvis was free of the neoplasm. The pelvic measurements were ample.

No fetal parts presented although the fetus appeared to be overdeveloped. The general condition of the patient remained excellent. Blood pressure was normal; kidney and liver functions were normal.

The patient was due for delivery on June 1, 1924. On May 19, her membranes ruptured with no labor pains. She was admitted to the hospital at 4 A. M. on May 19, four hours after the membranes ruptured.

Rectal examination showed the pelvis empty. External examination, however, pointed to a breech presentation. Labor pains began at 10 A. M. May 19, but were insufficient. Labor was allowed to go on, and, failing to engage any presenting part in the pelvis in twenty-four hours, it was decided to examine the patient under anesthesia, and perhaps perform a cesarean section. This procedure would have been the best plan, but it was abandoned because it was found, on vaginal examination, that we had to deal with a foot presentation, with ample pelvic space, but insufficient pains.

At 12:10 A. M. on May 20, a No. 5 Voorhees' bag was inserted, and expelled at 11:45 P. M. on May 20. Only partial engagements of the parts occurred. With the cervix fully dilated, and patient fully anesthetized, examination showed a partial contraction ring on the left side, which failed to disappear under pressure and compete anesthesia. Delivery by podalic extraction was begun and both feet brought down. Every step in the delivery was attended with difficulty. Great difficulty was encountered in delivering the shoulders, and equally difficult was it to deliver the head. Resuscitation of the baby failed. The baby weighed 8 pounds and 3 ounces.

The patient's condition up to this time, was excellent. Immediately after the head was delivered, a sharp hemorrhage occurred. Attempt was made to deliver the placenta by Credé's method and to pack the uterus. The placenta was delivered easily, but there was profuse bleeding.

Examination at this time showed a large rent in the uterine wall on the left side, exactly where the contraction ring was located before delivery. The bleeding was profuse, and the patient was losing ground.

The uterine cavity and rent in the uterus, as well as the vagina, was packed with gauze as a temporary expedient, to control the hemorrhage, and preparations made for operation.

Twenty-five minutes after the rupture of the uterus was discovered, the patient was on the operating table, ready for the incision.

As soon as the abdomen was opened, a large quantity of free blood was en-

countered. There was a large rent in the wall of the uterus, posteriorly, immediately, beneath the pedunculated fibroid, the size of a large apple. There was free bleeding from the rent. The pedicle of the tumor was torn, and a large blood vessel was severed, which was bleeding rather profusely.

A supravaginal hysterectomy was done as rapidly as possible, and a drain inserted above and below. While the abdomen was being closed, 600 c.c. of blood was transfused and the patient returned to bed, all within one hour and ten minutes after the rupture of the uterus was discovered.

Convalescence was steady, although somewhat stormy the first four days. On the seventh day, it was noticed that gas escaped along the drain, both by abdomen and vagina. A fecal fistula developed, which, however, closed spontaneously before the patient left the hospital.

The specimen showed that there was a large rent in the pedicle of the tumor, the rent extending from the uterine wall into the tumor, and that a good-sized blood vessel had torn in the pedicle. This torn vessel was not controlled by the gauze tamponade, and it was the source of the blood in the pelvis found at operation.

DISCUSSION

DR. O. PAUL HUMPSTONE.—I do not believe a fibroid has to necessarily block the pelvis to be a very serious source of dystocia. Very frequently we find a breech presentation or some abnormal presentation with a fibroid in the lower zone of the uterus. I recently had a patient who had not had a child in sixteen years who developed a fibroid which, when I first examined her was the major part of the pathology. She was pregnant three months at that time with this intramural fibroid jammed down into the pelvis. As the pregnancy progressed the fibroid advanced out of the false pelvis so that it could be felt under the abdominal wall to the left of the uterus. In the last two weeks the fibroid seemed to descend slightly and to swell from edema, as I believed. The patient had a breech presentation and was allowed to go into labor. She continued in labor for several hours without any satisfactory advance of the presenting part, although there was dilatation of the cervix. I did a classical cesarean and a myomectomy and conserved the uterus. The thing that impressed me at that time was the edema of the lower portion of the uterus around the fibroid and the very great ease with which the uterus could have been ruptured.

DR. H. C. BURGESS, of Montreal, Quebec, (by invitation) presented a paper entitled **Hemorrhage in the Last Trimester of Pregnancy.** (For original article see page 49.)

DISCUSSION

DR. JOHN O. POLAK.—Taking up, the question of accidental hemorrhage, Dr. Burgess' experience practically agrees with ours. Since 1910, we have followed out a modified Rotunda method of treatment. We study the pulse and blood pressure and the condition of the uterus, together with the general condition of the mother. We then rupture the membranes, plug the vagina and give the patient, as was suggested by Tweedy, small doses of pituitrin, 2 minims at half-hour or three-quarters hour intervals, and apply a very tight abdominal binder. We have used morphine instead of heroine. It has been amazing to see these cervices melt away. These women deliver spontaneously. In only one case have we found it necessary to do anything else but this simple procedure, and of the apparent variety so far since 1910 we have not lost a single life.

In the concealed variety, we have had one very interesting experience that taught us the value of putting the same procedure into effect. In dealing with these cases

we have been a little more fortunate than Burgess perhaps because we have not been so radical except in this one case. These cases have been treated on exactly the same lines—the membranes have been ruptured, the head has been raised, the clots have been evacuated from the uterus and a very tight Beck binder, has been employed. This controls the distention of the uterus better than any applied binder that can be put on with safety pins. In this way the uterus is crowded well down on the pack in the vagina, and with a small dose of morphia, for the shock, helps to control hemorrhage. By constantly taking the hemoglobin and the blood pressure, evidences are at hand of what was happening in this particular case. The pulse not only ascended, but the blood pressure fell and the hemoglobin dropped in the course of about three hours from 60 to 30. We opened the abdomen, took out the uterus and found the only uterus that we have ever seen in our experience where the muscle fibers were infiltrated with blood and blood clot.

The one point that I think perhaps is a little too radical is the doing of version on these cases unless we have a completely dilated cervix.

I am gradually coming to feel that many cases of placenta previa should be handled by rupture of the membranes in a very similar manner and with the same methods we are using in ablatio. Bleeding never occurs if the woman has no pain; consequently if we check the pain the bleeding will check itself, and that is done by giving morphia.

Dr. Burgess' point about examining these women to find if they have placenta previa is something that should be broadcast throughout the profession. As illustrative of that point I would like to refer to a case of painless, causeless hemorrhage. There was no question as to it being a case of placenta previa. The patient had a twin pregnancy. I was just turning away when the doctor asked, "Aren't you going to examine her?" Yielding to this suggestion, I took a glove, slipped my finger into the rectum and was met with a flow of blood that was absolutely appalling. Fortunately, it was a good hospital. On the table alongside the bed were another pair of clean gloves, a large uterine pack and a pair of forceps and a speculum. I packed the patient and gave her a hypodermic of morphia and in an hour's time she rallied. Then I did a cesarean section for a central placenta previa; both babies and mother recovered. They brought to my mind, as Dr. Burgess has said, the point that we should be satisfied that painless, causeless hemorrhage is suggestive of placenta previa and not try to find out how the placenta lies by going through the cervix and disturbing the blood-clots which have already checked the hemorrhage.

DR. G. L. BRODHEAD.—With regard to extensive concealed hemorrhages, many of those patients are seen by us for the first time when they are in poor condition, the uterus distended with blood. Personally, I believe that the very best treatment in those cases is prompt and speedy cesarean section. I think the best results are obtained in that way, and I think Dr. Burgess is inclined to believe that himself. For the apparent hemorrhage where the patient can be delivered at once, I am sure we are all in full accord with the opinions of the reader of the paper. The conservative treatment outlined by him and spoken of by Dr. Polak certainly should be used. In these cases we occasionally use the de Ribes' bag in addition to the rupture of the membranes: it seems to facilitate the progress in these cases.

In regard to placenta previa, I think the teaching of terminating the case at once when the diagnosis of placenta previa is made is absolutely correct. These patients sometimes are allowed to go on bleeding for days and possibly weeks and by the time they are brought to the hospital they have lost several quarts of blood which in addition to the blood they lose during the delivery is going to seriously jeopardize their lives; at any rate they should be given a long convalescence in the hospital. We have used the de Ribes' bag in placenta previa almost as a routine. The use

of the de Ribes' bag, which will dilate the cervix or almost so, followed by podalic version immediately after the bag has come out gives, I think, the best results in placenta previa. Dr. Burgess is correct in saying that where we have hospital facilities cesarean section in primiparae at least, with central placenta previa is the method of choice. After the birth of the child we have usually expressed the placenta by the Credé method, and failing in that we have removed the placenta manually. In placenta previa we have routinely packed the uterus with iodoform gauze.

With regard to lacerations of the birth canal, I think that the one case in which the doctor found laceration is an exceedingly small percentage. I am sure that if accouchement forcé is used, you are going to get many cases of laceration of the cervix, and it seems to me to be probable that lacerations of the cervix in general work are far more frequent than the paper would lead us to believe.

DR. RALPH H. POMEROY.—I suppose it would perhaps be unfair if I did not take advantage of this occasion, to at least call attention to what perhaps we might modestly term the Brooklyn Hospital attitude toward the part of Dr. Burgess' subject that has not yet been commented on, and that is the element of postpartum hemorrhage. The interns, the nonsurgically experienced obstetricians and the surgically experienced obstetricians at the Brooklyn Hospital, consider that the postpartum hemorrhage bugbear is nonexistent, that it has no business to occur in a proper surgically managed third stage, and that at least I can discover a following of some score in Brooklyn who think that matter has been almost demonstrated. Our statistical facts of the last few years at the Brooklyn Hospital reduced even to the lowest number of postpartum hemorrhages in about 900 cases a year, amount to not over two or three doubtful cases in the course of a year.

It may be heretical, but it appears to me very necessary for us as surgical obstetricians to make a very definite distinction between the plan that is proposed and is commonly carried out of dealing with the third stage of labor on a strictly midwife basis, that is the let-alone plan. If we think of the conditions under which postpartum hemorrhage of any degree occurs, it must occur with a partially detached placenta and with an uncontracted uterus. Therefore, the logical condition that we wish to achieve as soon as possible after the delivery of the child is a completely detached placenta and a contracted uterus.

We follow with definite emphasis in the Brooklyn Hospital a program of this type: We assume that every labor case should be terminated as a surgically managed case under an anesthetic, that the second stage of expulsion is always terminated with the woman under complete anesthesia, and in most cases, in the primiparae at least, we expect that we will immediately follow with some form of reconstruction or repair of the pelvic floor. Therefore, our anesthetic procedure begins to be complete from the time of the termination of the second stage until the third stage and the repair completed.

Now, it is impossible to think of such a proposition in terms of midwife waiting for the expulsion of the placenta. You must think of it in terms of an empty, contracted uterus, continuous anesthetic and a repair.

Our technic implies that when the child is delivered we immediately give a full ampule of pituitrin as soon as the first reasonable contraction of the uterus takes place, which is almost invariably within five minutes; the placenta is expelled with the patient under a deep anesthesia.

In the exceptional condition of the actually adherent placenta, which we consider also usually to be a myth, one should go in and remove the placenta manually after the method which has been so emphatically indicated by Dr. Potter, by seizing the placenta within the membranes. The risk is very small indeed. Once emptied, the uterus is controllable both by the continued effect of the pituitrin and

by the fact of the patient being completely under the anesthetic. With the recti muscles and the diaphragm entirely relaxed it is always possible to seize the body of the uterus and lean it out of the pelvis, to pull it up, to compress it between the two hands, one over the symphysis and one above it, and, if necessary, it can be held in any doubtful case where there appears to be a disposition on the part of the uterus to relax. In any doubtful case an assistant can control this while the rest of the operative procedure is carried out in the repair below.

We do not use a binder. The uterus is not encouraged to be driven down into the pelvis either by any specious management or by one's duty to control and manipulate the fundus.

DR. BURGESS (closing).—Dr. Brodhead states that in every case of concealed hemorrhage cesarean section should be done. As I have said, our experience has been almost too limited to make any emphatic statement of that character. The statistics are not good. Our own results with a major operation have been far from satisfactory, and I am inclined to think with Polak that these cases of concealed hemorrhage will perhaps be treated better by the same line of treatment that we have employed in the apparent type. If one can control the bleeding by vaginal pack and by diminishing the size of the uterine content, I fail to see why one should risk going into the abdomen.

DR. H. W. MAYES (by invitation) presented a paper entitled **Mercurochrome in Obstetrics.** (For original article see page 61.)

DISCUSSION

DR. A. B. DAVIS.—At the N. Y. Lying-In Hospital we have not made a study which can be described and expressed as graphically as in the paper to which we have just been listening. It may be that valuable information can be secured by making such studies. I know that it is possible to achieve such results by simple methods and without so much treatment and interference within the vagina. I state this fact as the outcome of experience and observation extending over a considerable number of years, involving thousands of deliveries. During this time we have used all kinds of douches and antiseptics. Many years ago it became the fashion to attempt to cleanse the vagina by means of soap and a soft brush. In nearly every case so treated there followed a moderate rise of temperature and at no time in the history of the hospital was there so much evidence of mild sepsis. During 1924, there were 5,508 women confined at the Lying-In Hospital, all but twenty-three of these were discharged alive. For the past seven years, since I have been chief surgeon there, it has been my custom to see the temperature charts of practically every patient almost daily. We have a fairly large number of operative and complicated cases and yet, I believe we have a daily average of not more than eight cases with temperature above 99°. We follow a very simple technic for deliveries. It has been demonsrated that bacteria are present there, but if left alone, certainly in our hands, they care of themselves, and we do not have a morbidity of 12 and 13 per cent such as has been reported here tonight, following the use of mercurochrome. Our cases are not selected. We delivered 492 women last month and there was no case of morbidity reported from the Out-Door Department, only five from the In-Door. These reports are duplicated month after month and year after year. With such results, I fail to see where we would derive any benefit from changing our technic, and attempting to destroy the bacteria in the vagina by any agent.

DR. RALPH M. BEACH.—I admit that I was skeptical about the value of any vaginal applications or antiseptics of any kind, but as I watched this work progress I became more and more impressed with the fact that there was something in it. When we take our series of fourteen successive inductions of labor with no morbidity whatever, there must be some value to the method. As far as we were able to find from the literature, nobody has been able to report similar results. Sidell's recent statistics with iodine show a morbidity of one out of nine.

In the last thirty-seven cases of labor we have had no morbidity whatever with the mercurochrome technic. There were twenty-six normal and eleven operative deliveries, including one cesarean section, three versions, two breech extractions and five forceps deliveries.

We thought that when we made rectal examinations there would never be any excuse for morbidity or sepsis, but in spite of that we still have morbidity and it must be due to the bacteria which are present in the vagina.

Unfortunately, this series of cases as presented here this evening by Dr. Mayes is not large enough, but I believe as we continue to report these cases we will have better results.

DR. HAROLD BAILEY.—Apparently it is true that the morbidity in the cases in which the vaginal tract is sterilized differs but little from the morbidity in the cases with no sterilization. However, it seems to me that if we look upon this as a logical procedure, it is absolutely foolish to paint the outside and leave the inside exactly as it was when the woman arrived under our care.

Cases sometimes come to us after they have been operated on. If we do not take measures to protect them from the bacteria in the vagina, it seems to me that we do not fulfill our duty.

Conservatism has been carried so far that in many clinics they do not even douche out the vagina before a forceps procedure. I think that this is entirely wrong. Some method of sterilization should be employed, and probably the use of mercurochrome is the best.

DR. HERMANN GRAD.—I have reason to feel that there might be some element of danger to the babies from a vaginal douche of bichloride or mercurochrome. I base that assertion on an experience where I believe the baby's life might have been sacrificed as the result of a bichloride douche given immediately before a cesarean section. In this case the patient had a justominor pelvis, a very large baby and a high-forceps application had been made outside the hospital. She also had twelve vaginal examinations. The operation which I did was of the transperitoneal type. The baby was alive immediately before the preparation for operation. The attending physician felt that having had so many vaginal examinations she should have a 1-5000 bichloride douche, which was given. On delivery it was a perfectly well-developed baby and weighed about 9 pounds but it was dead, and possibly the bichloride of mercury douche might have been a factor. We know that amniotic fluid enters the lungs of babies by aspiration. It seems to me that the procedure may have some effect when the membranes are ruptured.

DR. H. W. MAYES.—The best way to cleanse the vagina, when it contains mucous or blood, is to instill the mercurochrome as has been described, then wipe the vagina out thoroughly with a dry sponge, and use more mercurochrome. I have done this in several cases and in one with a marked vaginitis, which had a thick membrane covering the entire vagina. The foreign material was removed in this manner, an episiotomy and low forceps was done and the patient had no morbidity, although the smear showed numerous bacteria, including the gonococcus. I am convinced that this is a better method of cleansing the vagina than by the use of the douche which is apt to carry infection into the uterus.

There is no comparison between bichloride of mercury and mercurochrome, for the former is toxic and the latter is nontoxic. We have had no toxic symptoms in either the mothers or babies following the use of mercurochrome. We have used it frequently in treating babies with impetigo and the heads of many of them have been stained with it during delivery.

When lysol is used in the vagina during delivery it often causes a rash on the baby. We do not get this with mercurochrome. Iodine in the vagina is not practical for delivery because it is irritating and may cause blistering or even a mild vaginitis. In the iodine series we used the iodine only externally and not in the vagina.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

TREATMENT OF CANCER OF THE CERVIX. SHALL IT BE RADIUM OR OPERATION?

A COLLECTIVE REVIEW OF THE RECENT LITERATURE

BY JOHN OSBORN POLAK, M.D., AND GEORGE W. PHELAN, M.D.,
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THE treatment of cancer of the cervix presents one of the problems of the day, and is not only of interest to the profession, but to the laity. Shall it be treated by radical operation, or by radium, or by a combination of radium, operation and postoperative radiation, is the question that is confronting the surgeon.

That the incidence of cancer is actually on the increase, there seems to be no room for doubt. That a certain proportion of the public have cancerphobia is also an evident fact to clinicians in every large community; while doubt as to its curability is "back in the mind" of both medical man and patient. Though we have no definite knowledge as to the cause of cancer, we do know that it begins *as a local lesion, which at one time in its clinical course is amenable to radical removal, or complete destruction.* Furthermore, we know that cervical lacerations and chronic infections of the cervix, which subject the cervical tissues to chronic irritation, are precancerous factors.

Unfortunately, early epithelioma or carcinoma of the cervix is a rare clinical finding; for the majority of the patients do not present themselves to the surgeon until the disease is far advanced. Hence, our efforts must lean toward prophylaxis in the cure of precancerous lesions, such as infections and traumatisms of the cervical tissues until cervical cancer can be recognized in the incipient stage. When first seen by the physician the lesion has already passed beyond the incipient stage, for bleeding, which is usually said to be the first symptom of cancer of the portio, cannot occur until the new tissue begins to break down and superficial necrosis takes place; in other words, until there has been active cell proliferation. These same conditions for many years prevailed in tuberculosis; but by organized propaganda and proper education of both the public and the profession, it has been demonstrated that tuberculosis is amenable to treatment and cure. So, also, is cancer, if the initial stage can be discovered at the time when it is a localized simple growth. Whether this initial growth shall be removed by radical extirpation or destroyed by radium, is the question under discussion in this review.

Experimental study of the behavior of implantation cancer allows us to draw an analogy between its behavior in animals and when similarly located in man. These experiments have shown that where cancer is implanted in the healthy animal, and the animal is properly nourished, the graft takes, but the growth usually remains localized and fails to metastasize—in other words, the animal establishes an immunity against the cancer's further growth, and the implant may remain localized for months or years, or as long as the animal remains in good health. On the other hand, if this animal is subjected to repeated or continuous blood loss, the growth, which up to this time has been quiescent, rapidly develops and metastasizes; or if the tissues immediately surrounding the graft are traumatized, the implant grows with great rapidity; or again, if the animal is subjected to prolonged ether or chloroform anesthesia, extension of the growth into the surrounding tissues is stimulated.

These three conditions, i.e., blood loss, trauma, and prolonged anesthesia, obtain in every radical operation for the removal of a malignant growth. Therefore, it may be presumed that in the woman suffering from cancer upon whom the radical operation is done, the immunity which she has developed against the growth, for the time being at least, is broken down—and if metastasis has already occurred, or if the operation has not completely removed every vestige of the tumor, rapid recurrence may be expected; for her tissue reaction has been reduced by these three factors.

The radical operation has a primary operative mortality of from 8 per cent to 20 per cent which must be taken into consideration in evaluating the results of surgery versus radium. Radium and x-ray, on the other hand, may be used without increasing either the blood loss, or traumatizing the surrounding healthy tissues, and may be applied in many instances without a general anesthetic. Hence, irradiation has an advantage over operative procedure, *in that group of cases in which the radium can be placed in direct contact with the tumor mass.*

Furthermore, irradiation of the parametria with the x-ray establishes a connective tissue barrier which limits the lymphatic extension.[5] This is especially valuable in cervix cancer, for in this type of growth extension and recurrence is confined to the pelvis and is, therefore, more readily attacked.

Operability is a variable personal equation that cannot be sharply defined, hence it is of greater clinical value in this discussion for us to accept the morphologic grouping of the cases of cervix cancer as they present themselves to the surgeon.

According to H. Schmitz,[1, 2] the cases that present themselves for surgical or radium treatment fall into one of four general groups:

1. The clearly localized simple growth, the primary ulcer or nodule, with no extension or infiltration into the surrounding cervical tissues—the case in which the diagnosis can only be made by biopsy specimen.

2. The nodule or ulcer with beginning infiltration of the surrounding cervical tissues but which has not extended beyond the confines of the cervix.

3. Multiple growths with infiltration of the parametria, this infiltration may be recognized by rectoabdominal examination.

4. Cancer of the cervix with extensive ulceration and necrosis, infiltrating the surrounding tissues producing sepsis, hemorrhage and cachexia.

It is conceded that the treatment of carcinoma, whether it be by radium or operation, to be of any avail, must be carried out in the early stage. It is, therefore, of the utmost importance that the disease should be recognized at the earliest possible moment; for if an epithelioma or carcinoma has overspread the limits of the cervix, the case is usually hopeless as to permanent cure. Therefore, in the treatment of patients with cervical cancer, falling within Group 1, namely, where the lesion is a clearly localized simple growth, radium alone or combined with deep x-ray therapy and the radical operation come into competition.

In America, few surgeons except Kelly, Schmitz,[1, 2] Clark,[3] Crile, Bailey and Healy,[5] elect radium in preference to radical extirpation. However, a careful review of their statistics and end-result seems to prove their case in favor of radium and intensive x-ray radiation of the parametria.

Operative treatment: In considering the operative treatment, we must first take into consideration the question of operability. In Europe, where both the laity and the profession are better educated in the subject of cancer of the cervix, the operability ranges from 60 per cent (Wertheim) to 90 per cent, as claimed by Bumm.[4] In New York 20 per cent may be taken as a good average.

Primary mortality: The radical operation for cervical cancer is the most serious procedure that the gynecologist is called upon to do; for the extensive dissection which is necessary imperils the integrity of the ureters, bladder and rectum—and aside from the danger of trauma to these structures, the wide exposure of cellular tissues opens up avenues for streptococcic infection and fatal peritonitis; for it is well known that these proliferating carcinomatous growths are frequently the abode of the streptococcus. Furthermore, pieces of carcinomatous tissue may be implanted in the operative area. Hence, it will be seen that the blood loss, traumatism, prolonged anesthesia and infection all contribute their share to the primary mortality. Hemorrhage, shock and peritonitis are the usual causes of death.

In this country, the primary operation mortality ranges from 8 per cent to 20 per cent; in Europe from 5 per cent to 11 per cent. It may, therefore, be conservatively stated that even in the hands of the most competent surgeons, 10 per cent mortality is a fair average. Thirty per cent of cures after the five year period is about all that can be claimed for the radical operation by even the best American operators.

Hence, in studying the final statistics, it is unfair to compare operative results, which in reality, only record those women who have survived the operation with those obtained by radium and deep x-ray therapy which include "all comers."

For example: Of 100 cases of cancer of the cervix applying for operative treatment, at most only fifty can be accepted as operable, and of these five will die from the operation; so that of the forty-five surviving the operation, but fourteen or 30 per cent can be expected to survive the five year period. Consequently, of the 100 cases, only fourteen are alive at the end of five years.

With radium, on the other hand, all of the 100 will be accepted for treatment, and of this number, we can expect at least 15 to 25 per cent[10 and 12a] to be alive at the end of five years with practically no primary mortality.

Ward,[12a] before the American Medical Association, 1925, reporting upon all cases of cancer, in all stages, which received radium, treated at Woman's Hospital, including both the operable and inoperable cases, shows 25.9 per cent to be alive at the end of five years, while in the operable group 52 per cent are living after five years.

Therefore, we must admit that radium alone or in conjunction with deep x-ray therapy is a measure which is now accepted for the complete and permanent cure of cervix cancer; for there is sufficient accumulated evidence to show that this treatment has been entirely satisfactory. Certain clinical facts have been observed:

1. Radiation has had its best success in the several forms of epitheliomata.

2. Cervical cancer of the adenomatous type is less susceptible to successful radium treatment than is that of the squamous cell variety.

3. Destruction of the cells acted upon by the gamma rays is shown by swelling and vacuolization of the protoplasm and shrinking of the nuclei; this is followed by phagocytosis and absorption, and the space occupied by the destroyed cells is replaced by a homogeneous connective tissue network.

4. As squamous cell epitheliomata originate from the epithelium of the vaginal portion of the cervix and tend to grow outward into the vagina, the application of radium in this type of growth produces the most astonishing results.

According to Frank, Healy and Bailey,[6a] the parametrial cellular reaction plays a large part in the temporary curative effects produced by radium; for under the influence of the rays, this connective tissue proliferates, contracts and hardens, and by the production of dense scar tissue blocks the lymphatics and the smaller blood vessels and starves the growth, having a similar effect to that obtained by ligation of the internal iliac arteries.

We have previously stated, "It is conceded that the treatment of carcinoma, whether it be radium or operation, to be of any avail, must be carried out in the early stage," and by that we mean those cases which fall under the morphologic classification known as Group 1.

That this broad statement is true concerning operation, there can be no doubt, but with accumulated statistics concerning the so-called "five year period cures," radium presents a little brighter picture, for even in the borderline class radium can claim over 30 per cent of cures.

E. Muhlmann[6] states that, comparing the observations of Döderlein, Seitz, Wintz and Flatau, 10 to 20 per cent of permanent recoveries may be assumed for inoperable carcinoma; while H. Heyman[7] claims that 16.6 per cent of the inoperable cases were free after the five year period.

Numerous other statistics could be quoted, but the above are sufficient to show that to even the hopeless case some hope can be given.

Another point well worth remembering in the use of radium and x-ray is the considerable delay in mortality. Greenough,[8] in the report of the Committee on Treatment of Malignant Disease with Radium and X-Ray (American College of Surgeons), says the duration

of life in the unsuccessful case is greater with radium than with operation; while it may be further stated that in the unsuccessful cases there is a marked amelioration of the symptoms complained of, the pain is less, the bleeding negligible and sepsis is absent.

In a review[9] published five years ago in this journal, on the same topic, the final conclusion was as follows: "The results with radium in operable cases alone are still inferior to operation, amounting to 31.5 per cent (131 out of 415) as compared to 45 to 50 per cent by operation; but closer analysis will show that while the percentage of operative cures is greater in the early operable group, the percentage of radium cures is greater in the borderline case." We can still subscribe to the latter part of the above conclusions, but feel that the percentage of cures by radium in the first group now leads that of any other method. In Schmitz's article forty-three cases (Group 1) are reported from five different clinics with a 51.56 per cent of "five year cures."

In conclusion, we must all agree that it needs but one reliable report covering a sufficient number of cases falling in Group 1 to prove the value of radium as against surgery, and that we believe has now been presented in the 1918 to 1925 report of the work at the Memorial Hospital by Healy and Bailey[6a, 20] with its 50 per cent of cures after the five year period.

Where surgery is done, the parametria should always have post-operative irradiation and finally the great success of radium in borderline cases of the epithelomatous type justifies its acceptance as a curative measure, without recourse to subsequent surgery.

REFERENCES

[1]Schmitz: Surg., Gynec. and Obst., 1924, xxxix, 775 and 839.
[2]Schmitz: Jour. Am. Med. Assn., Jan. 10, 1925, lxxxiv, 81-84.
[3]Clark, J. G.: Ann. Surg., 1924, lxxx, 138.
[4]Bumm: Archiv., 1923.
[5]Bailey, H., and Healy, W. P.: Jour. Am. Med. Assn., Oct. 4, 1924, lxxxiii, 1055.
[6a]Healy: Phila. Obstetric Society, April, 1925.
[6]Muhlmann, E.: Strahlentherapie, Berl. u. Wien. 1923, xvi, 137, No. 1.
[7]Heyman, H. V. J.: Obst. and Gynec. Brit. Emp., Manchester, 1924, xxxi, 1, No. 1.
[8]Greenough, R. B.: Surg., Gynec. and Obst., July, 1924, xxxix, 18.
[9]Tausseg: AM. JOUR. OBST. AND GYNEC., i, 314.
[10]Radium Report of the Memorial Hospital, 1923.
[11]Clark, J. C., and Block, F. B.: AM. JOUR. OBST. AND GYNEC., May, 1924, vii, 543.
[12a]Ward, G. G.: Jour. Am. Med. Assn., Sect. of Obst. and Gynec., May, 1925.
[12]Jones, T. E.: AM. JOUR. OBST. AND GYNEC., May, 1924, vii, 541.
[13]Regaud, C.: Jour. de radiol. et d'electrol, Paris, November, 1923, vii, 510.
[14]Van Raamsdonk, C. P.: Nederlandsch. Tijdschr. v. Geneesk, Leiden, 1923, xii, 45, No. 2.
[15]Ostreil, A.: Prakticky lek, Prague, No. 1, 1923, iii, 251.
[16]Gagey, Jean: Bull. Soc. d'obst. et de gynec. de Paris, 1924, xiii, 22, No. 1.
[17]Daels and DeBacker: Brit. Jour. Radiol. (B. I. R. Sect.), London, Sept., 1924, xxix, 315.
[18]Schreiner, B. F.: Am. Jour. Roentgenol., Oct., 1924, xii, 373.
[19]Boschensky, K.: Polska gaz. lek Cracow, Aug. 17, 1924, iii, 447.
[20]Bailey, H.: New York State Jour. Med., Dec., 1924, xxiv, 985, No. 21.
[21]Farmer, T. A.: New York State Jour. Med., Feb., 1925, xxv, 195, No. 5.

Selected Abstracts

Physiology and Pathology of Menstruation

Seitz, A.: The Present Status of the Knowledge of Menstruation. Medizinische Klinik, 1922, xviii, 1013.

By the term menstruation is meant not only regular physiologic bleeding but also the associated organic and functional disturbances which may involve every organ in the body and the psyche. It has been shown that there are definite waves in the life of a woman and the organs responsible for the changes have been studied; but despite this, no definite answer has been found to the why and wherefore of menstruation.

During the last ten to fifteen years an important step forward has been made in the recognition that there is a regular cyclic change in the uterine mucosa and that it is dependent upon definite anatomically controlled previous changes in the ovaries. Changes previously considered pathologic were shown to be normal.

The so-called normal endometrium is found in the middle third of the entire intermenstrual period. This is called the interval stage. The latter part of the entire period is called the premenstrual phase and the endometrium at this time looks like decidua. On the twenty-eighth day the premenstrual phase reaches its highest development. The next day bleeding takes place and this phase is called menstruation. The exact changes which occur at this time are still in dispute but the most modern belief is that there is a destruction of the mucosa which later becomes epithelialized. The return to normal is called the postmenstruum and on the tenth day the interval phase is again reached. Schroeder has advocated a terminology for the four phases which indicate the associated changes in the ovary. Thus his substitutions are proliferation for interval, secretion for premenstrual, desquamation for menstrual and regeneration for postmenstrual.

The second great contribution has been the demonstration of the relationship between the cyclic changes in the endometrium to the changes in the ovaries; namely, maturation of the follicle, the formation of a corpus luteum and retrogression. Rupture of a follicle and with it the beginning of a corpus luteum takes place just before the change from the proliferation to the secretion phase, on the fourteenth to sixteenth day. On the twenty-fifth day the corpus luteum is completely formed and its phase of bleeding begins. This continues until the twenty-eighth day which marks the highest development of the premenstrual phase in the uterine mucosa. If no fertilized egg is implanted, the mucosal changes take place and at the same time retrogressive changes begin in the corpus luteum. Also new follicles begin to mature. The proliferation of the endometrium is dependent upon the presence of a mature follicle and the secretion phase (premenstrual) upon a corpus luteum. When rupture of a follicle takes place usually in the latter half of the second week, there is present an ovum capable of being fertilized.

The desquamation of the endometrium is determined by the onset of retrogression of a corpus luteum and this in turn is brought about by the death of an ovum. Since the endometrium in the premenstrual phase is similar to the decidua of pregnancy and the corpus luteum of menstruation is similar to that of pregnancy, it may be assumed that these changes are preparations for pregnancy. Furthermore changes found during menstruation (pigmentation, thyroid and gastric disturbances, etc.),

are also found but in exaggerated form during pregnancy. A short definition therefore is as follows: Menstruation is a preparation of the female organism for the implantation and further development of a fertilized egg. J. P. GREENHILL.

Labhardt and Hüssey: Menstruation and Cyclic Changes. Zeitschrift für Geburtshilfe und Gynäkologie, 1922, lxxxiv, 715.

The authors believe that menstruation should not be considered an isolated phenomenon independent of the other functions of the organism. Rather it is merely a prominent symptom of recurring periodic changes in the organism as a whole. These cyclic processes affect the most varied organs and organ-systems. All parts of the genital tract take part in them. Corresponding to this genital cycle, there is furthermore an extragenital cycle in which participates the blood and the blood elements, the heart, the nervous system, particularly the temperature regulating center, also the nerve elements regulating blood pressure, the endocrine glands and the skin, and there are even certain changes in the psychic functions.

By biologic methods, the authors were able to determine cyclic variations in the quantity of certain proteinogenous amines in the blood serum which had a marked effect upon the vasoconstrictors of the peripheral vessel system. They found that this wave coincided with the menstrual cycle. The high point of the wave lies always in the pregravid stage or in the beginning of menstruation. The cause of this wave lies in the monthly preparation for a new pregnancy. There is an increased activity made necessary by the increased demand on the organs. When the ovum is not fertilized, the activity decreases and there is a decline in the wave. Menstruation is only an incidental symptom of the general cyclic change. The important phase is the premenstrual or pregravid rise in the wave which then in the first days of the menstrual bleeding rapidly falls. MARGARET SCHULZE.

Frankl, Oskar: Menstruation and Ovulation. Dublin Journal of Medical Science, 1921, iv, 481.

The functions of the female genital organs are dependent upon a "balance" in the secretion of the several ductless glands. The first and of most importance is the hypophysis whose anterior lobe influences the growth and development of the genitalia. The essential cells of the anterior lobe show enlargement during pregnancy, while the effect of the posterior lobe on the organism is well established. Frankl recommends the treatment of amenorrhea by means of pituitrin, and concludes that for normal menstruation an intact hypophysis is essential. Second in importance he specifies the pineal gland, based on the production of adipose tissue and vasomotor disturbances, which are associated with the activity of this gland. As regards the thyroid and its effect on genital functions the author reports original observations on the relation of thyrotoxin to ovarian lesions and amenorrhea. "The ovary and the chromaffinic system are antagonists; the absence of the ovary protects the chromaffinic system, and consequently, the sympathetic system. On the other hand, the thyroid furthers the chromaffinic system and increases the irritability of the sympathetic nerves. Therefore, the thyroid and chromaffinic system are synergists."

The relation of the adrenals to the ovary is strictly antagonistic. As regards the time and relation between the several phases of ovarian activity and the uterine changes during menstruation, the author concludes that the follicle ruptures between two menstruations, and the uterine changes are dependent on the ovaries. "The corpus luteum operates on the mucous membrane by its hyperemia-producing stimulation." Menstrual bleeding is provoked by the involution of the corpus luteum.

A. N. CREADICK.

Strasman, E.: Why Does the Graafian Follicle Rupture? Archiv fuer Gynaekologie 1923, cxix, 168.

The primordial follicle consists of ovum and simple epithelium in the resting stage. The author does not take up the maturation of the ovum itself. Development begins by an increase of the granulosa cells especially at the side near the surface and the side directed towards the center of the ovary. The follicle thus becomes elliptical and a fissure forms at the peripheral pole. The ovum remains in the deep pole in the discus proligerus. Up to this stage the follicle has pushed deeper into the ovary, but now it pushes towards the surface. The theca is formed from the stroma, its inner layer being rich in cells and its outer layer poor in cells. The outer layer of the theca proliferates more rapidly than the remainder and brings about the rise of the follicle by its own elasticity, and the softening of the surrounding tissues. As this takes place the discus proligerus migrates towards the surface by means of a one-sided proliferation of the granulosa which forces the discus peripherally. A further increase in the follicle is due to a fluid increase. The follicle with the help of the theca reaches the surface; the upper portion becomes atrophic and the follicle ruptures. The outpouring of the fluid carries the ovum with it. The development and rupture of the follicle can thus be readily explained.

RALPH A. REIS.

Szymanowicz, Joseph: Observations on the Proliferation of the Uterine Glands in a Woman. Gynécologie et Obstétrique, 1922, v, 129.

The author agrees with the classification of the uterine mucosa into postmenstrual, interval, premenstrual, and menstrual phases. He thinks, however, it might be more simple to establish the following divisions on a biologic basis: (1) The menstrual stage marked by commencement of the hemorrhage. There is a very marked difference during this stage in the cellular changes. (2) The proliferation of the glandular elements with progressive enlargement of the glands continuing from the second day after the beginning of the menstruation and continuing until the rupture of the follicle, is without doubt regulated by this structure. (3) A period of decidual form cell-differentiation and secretion which is coincident with the formation and evolution of the corpus luteum and is probably dependent upon it. F. L. ADAIR.

Novak, Emil, and Te Linde, Richard W.: The Endometrium of the Menstruating Uterus. Journal of Am. Med. Assoc., 1924, lxxxiii, 900.

In order to study the menstrual changes of the endometrium the authors timed twelve hysterectomies so as to be performed during some phase of actual menstruation. Their study convinces them that during menstruation the extensive loss of tissue is the rule. The compacta and most of the spongiosa layer are cast off. The first day shows beginning loss of tissue, on the second day the throwing off is very extensive, all the compacta and most of the spongiosa being gone. Regeneration becomes evident on the third day. The desquamation is preceded by extensive infiltration with polymorphonuclear leucocytes and lymphocytes. The throwing off of the mucosa does not occur in large masses. It is a crumbling, molecular process. Regeneration is remarkably rapid, especially the epithelization of the surface. Source of the new epithelium is chiefly the epithelium of the basal stumps of the uterine glands. While diapedesis may play some part in the mechanism of menstrual bleeding, rhexis is the most important factor.

GROVER LIESE.

McArthur: Removal of Both Ovaries and Persistence of Menstruation. The Medical Journal of Australia, 1924, ii, 193.

The author reports three cases occurring in his experience where menstruation occurred regularly for years following removal of both ovaries.

After mention of this occurrence, the author proposes the interesting possibility of other endocrines, particularly the pituitary, thyroid, and perhaps the adrenals, imitating the function of the ovarian secretion and independently producing menstruation. NORMAN F. MILLER.

Köhler: Influencing Menstruation by Resection of the Ovary. Zentralblatt für Gynäkologie, 1923, xlvii, 1695.

The writer reports seven cases in which resection of one or both ovaries (partial castration) has had a marked effect in influencing irregular and profuse bleeding. He concludes from his results that the ovarian influence on menstruation is primarily an impulse from the ruptured follicle with resultant corpus luteum, and only secondarily from the various stages of ripening of the follicles of both ovaries. The main factor, of course, is the first, but the unripe follicles also appear to have some effect, and the diminution of the ovary by operation has its effect in its influence on this particular factor. The function of internal secretion of the ovary appeared absolutely uninfluenced by partial castration. LITTLE.

Kross: Uterine Secretion. Its Effect Upon Coagulation of the Blood. Surgery, Gynecology and Obstetrics, 1923, xxxvi, 217.

Kross ligated the uterus of rats and from two to five weeks later removed the secretions which had accumulated. He found that this secretion had a distinct digestive action on blood of the same animal. In the first place it delayed the clotting time of the blood and upon incubation completely redissolved the clot. This is in accord with the work done previously by Bond, Whitehouse, and Halban and Frankl. The latter believe that the digestive action of the uterine secretion is directly responsible for menstruation.

Kross makes the deduction that in abnormal uterine bleeding there may be an abnormal amount of the tryptic ferment present which, as Halban and Frankl have shown, is normally found only in the premenstrual mucosa. This abnormal secretion again, according to Kross, is probably caused by abnormal ovarian function. R. E. WOBUS.

Cullis, Oppenheimer and Ross-Johnson: Observations on Temperature and Other Changes in Women During the Menstrual Cycle. The Lancet, 1922, ccciii, 954.

These observations are based on the study of sixteen female medical students for a period of from three to eleven months. The temperature records were taken orally and rectally before getting up in the morning, and before going to bed at night. The pulse rate was taken at this same time. Blood pressure observations were made about 10 A.M., after the student's arrival at the laboratory.

The temperature variations showed a maximum value in the premenstrual phase. The menstrual value was the minimum, there being a rapid fall from the premenstrual to the menstrual. The postmenstrual value was occasionally the same as the menstrual, but in the majority of cases, showed a slight rise through the intermenstrual period until the maximum was again reached in the premenstrual phase.

The figures for the average pulse frequency in each period also showed rhythmic variations. The postmenstrual rise appeared to be more rapid; the value for

the intermenstrual period was nearly as high and sometimes higher than that for the premenstrual phase. The menstrual and postmenstrual figures are always lower than the rest of the cycle. The range of variation, however, was small.

In the blood pressure value no definite variations were noted.

NORMAN F. MILLER.

Lintz and Markow: Relation of Onset of Menstruation to Environment. Endocrinology, 1923, vii, 57.

In an analysis of the menstrual histories of 800 consecutive women in their private practice, Lintz and Markow attempt to show that environment has very little if any effect on the age of onset of menstruation. They compared the histories of girls reared in small towns, small cities, and the larger cities and found the average age of onset was practically the same. They conclude that the endocrinologic heritage more than any other factor determines the age of onset.

W. KERWIN.

Rosenbaum: Blood Platelets Before and After Thyroidectomy, Especially at the Time of Menstruation. Zentralblatt für Chirurgie, 1924, xlvii, 2580.

That the thyroid has some vague connection with menstruation has been observed for many years but the exact *modus operandi* is not quite clear. Any phenomenon which tends to shed light upon this question is, therefore, of interest to the gynecologist. Rosenbaum found in eight observed cases of goiter that the blood platelets increased in number. This was especially marked in a case of Basedow. After thyroidectomy the number of platelets was invariably decreased, in three cases to less than one-half the original number. In some of the women there was a further decrease at the time of menstruation. In six women who still menstruated the flow was very much prolonged and very profuse, while one woman who had not menstruated for six months again had uterine bleeding after the operation.

R. E. WOBUS.

Amos: A Note on Variations of Blood Pressure During Menstruation. The Lancet, 1922, ccciii, 956.

Twelve patients were carefully observed, their blood pressures being taken at noon each day, just before the rest hour. The patients were doing the same amount of work every day and their diets were similar. The readings made were of the systolic pressure.

Early in the menstrual period, a decided fall of pressure was noted; after the rather sudden fall there was again a rise toward the end of menstruation or a day or so after the period was finished.

These observations were made in a sanatorium for patients afflicted with chronic tuberculosis.

NORMAN F. MILLER.

Blair-Bell: Intrinsic Dysmenorrhea. Journal of Obstetrics and Gynaecology of the British Empire, 1923, xxx, 119.

By the term intrinsic dysmenorrhea reference is made to pain due to inherent abnormality either in the structure of the organs of menstruation or in the physiologic process connected with the function. Primary dysmenorrhea refers properly to menstrual pain appearing with the onset of the function, secondary to pain appearing later. Extrinsic dysmenorrhea from acquired pathologic lesions is comparatively rare.

Premenstrual pain is rarely severe and is due to painful ovulation or the engorgement of an underdeveloped uterus. This type of pain occurring alone was noted in 30 per cent of the author's cases of dysmenorrhea. Premenstrual and comenstrual pain were present in 17 per cent of cases. Intramenstrual pain is due to colic from irregular contraction waves in an underdeveloped fibrotic uterus or from the efforts of a uterus to expel clots or membranes. Intramenstrual pain occurred in 50 per cent of women with menstrual complaints.

The pathologic findings in intrinsic dysmenorrhea are: underdevelopment or maldevelopment of the uterus, cervix or ovaries, intrauterine clotting of menstrual blood and occasionally exfoliation of the endometrium. Underdevelopment of the uterus is the most common cause of the complaint. Acute flexions, malposition and cervical stenosis or hypertrophy are common findings.

Dysmenorrhea in the acutely anteflexed uterus comes from interference with the normal uterine contraction waves. Treatment, if necessary, consists of dilatation and posterior division of the cervix. If this fails, anterior vaginal hysterotomy gives better results than repeated overdilatation of the cervix. Where acute anteflexion and hypoplasia of the fundus coexist the treatment of dysmenorrhea is seldom effective. Where dysmenorrhea accompanies displacement of the uterus in girls, replacement in the absence of hypoplasia relieves or cures in practically all cases. Conical cervix and pinhole os are not *per se* causes of dysmenorrhea. The logical treatment of such cases consists of thyroid and ovarian extracts combined with dilatation and posterior cervical incision. Dysmenorrhea with scanty menstruation occurring in a uterus of normal internal measurements is usually due to ovarian hypoplasia and the prognosis is poor. In young women a combination of ovarian and thyroid extracts gives good results in these cases. Operative treatment is rarely necessary.

Intrauterine clotting of menstrual blood is abnormal and occurs only in the presence of free or excessive flow. Bell believes that blood passing through the endometrium is acted upon by some substance which extracts fibrin ferment or prevents its formation. Blood passing through the endometrium too rapidly to be thus altered, clots either in the uterine cavity or vagina. In the former case menstruation may be painful. Adenomatous development of the endometrium is often present in these uteri. Treatment consists of dilatation with curettage.

Exfoliation of the endometrium is an occasional cause of dysmenorrhea. The etiology is unknown. Contrary to the prevalent idea the condition is not necessarily painful. Menorrhagia is usually associated. Treatment in these cases is directed toward the menorrhagia and is seldom satisfactory.

Bicornate uteri predispose to dysmenorrhea only in the presence of incomplete development of either horn.

The importance of pregnancy as a curative measure in intrinsic dysmenorrhea is overestimated. About 60 per cent of the author's cases conceived and 35 per cent were cured thereby. Seven out of fifty women with acute congenital anteflexion bore in all eight children. None of six women listed as true pinhole os externum and conical cervix subsequently bore children. No pregnancies occurred in the author's series of underdeveloped normally formed uteri. Three women out of eight passing menstrual casts bore in all seven children without influence on the condition. The beneficial effects of pregnancy on dysmenorrhea are due to increased muscular development.

The empirical performance of dilatation of the cervix and curettage for intrinsic dysmenorrhea is to be condemned. Catharsis, exercise for the rich, and rest and fresh air for the poor, are measures to be considered in all cases. Atropine, the coal tar products and in selected cases thyroid and ovarian extracts are still

the most valuable medical measures. Treatment directed toward the causal factors (membranous dysmenorrhea excluded) gave the author from seventy-eight to eighty-six per cent of cures according to the types of cases. H. W. SHUTTER.

Bond: A Note on the Ammonia Coefficient in Menstruation. The Lancet, 1922, cciii, 957.

During the premenstrual period there is a marked rise of the ammonia coefficient, which appears to be due to a rise in the output of urinary ammonia. In the post- and intermenstrual periods the coefficient varies little from the intermenstrual average. NORMAN F. MILLER.

Gemmel: Intrinsic Dysmenorrhea. Journal of Obstetrics and Gynaecology of the British Empire, 1923, xxx, 230.

Intrinsic dysmenorrhea is a functional derangement due to colic produced by faulty contraction waves in an underdeveloped, maldeveloped and possibly infected uterus. Pathologic study is obviously difficult but the usual improvement after cervical dilatation contradicts an origin from excessive fibrosis. Organic obstruction is rare. Colic from inharmonious muscle action accounts for many cases. Clots were passed by more than fifty per cent of the author's cases but there was no proof that they formed in the uterus. Congestion and infection after marriage make many cases worse. Pregnancy tends to cure or relieve menstrual pain. Sterility usually accompanies severe cases of intrinsic dysmenorrhea. Fifty-four per cent of 150 cases were permanently cured by gradual dilatation of the cervix. Ten per cent were free from pain for from three months to seven years, 35 per cent were relieved and treatment failed in 16 per cent. H. W. SHUTTER.

Johnstone: The Results of Operative Treatment of Intrinsic Dysmenorrhea. Journal of Obstetrics and Gynaecology of the British Empire, 1923, xxx, 226.

Dilatation and curettage is the standard treatment, best done ten days before a menstrual period. Dilatation should be gradual, effected with graduated metal dilators and continued until the cervix is completely paralyzed. The introduction of a stem pessary to maintain dilatation and promote muscular development is favored by the author. The stem in the absence of complications is left in place several weeks. The author and his colleagues (Edinburg) employing chiefly the operation of dilatation, with or without the introduction of a stem pessary treated 575 cases with 50 per cent of two year cures. Thirty-three per cent of women were relieved and 17 per cent unrelieved or worse. Plastic operations such as splitting the cervix (Dudley operation) or enlarging the os (Pozzi) are not favored. Of 218 married women who complained of sterility and dysmenorrhea about 50 per cent subsequently conceived with or without cure of the dysmenorrhea.
H. W. SHUTTER.

Hirsch: Dysmenorrhea of Spasmophilics, and the Cause of Menstrual Pain. Zentralblatt für Gynäkologie, 1924, xlviii, 1073.

Hirsch deals with dysmenorrhea in those cases in which there is no definite pathologic condition evident, and at the outset again asserts the evidence against the so-called "stenosis theory." In 85 per cent of all such dysmenorrhea the "asthenic type" is evident; and in 30 per cent there are clinical signs of spasmophilia. The dysmenorrhea in these cases is in no way mechanical, but rather due to the constitution of the individual. There is an associated distorted calcium

metabolism, due in turn to the endocrine influence. The clinical picture is an over-excitability of the peripheral nerves, an increased excitability of the muscles of the thumb, Aschner's phenomenon, (slowing of the pulse by pressure on the eyes), dermatographia and arterial hypertonus. The dysmenorrhea in these cases is one of the many symptoms of nervous and muscular hypersensitiveness in association with abnormal condition. The exciting cause of the pain is to be seen in the arterial congestion in the pelvis. The dysmenorrhea is usually very severe, frequently occurs several days before the appearance of menstrual blood, and may be associated with peritoneal irritation, accompanied sometimes by nausea and vomiting. The pain does not cease with the onset of menstruation, may last the entire period, and occasionally there may be crampy pains after the flow has ceased.

It is obvious that local treatment (with the exception of the application of heat) can do little good, in fact is liable to do harm. Narcotics are usually badly borne. Hirsch has no experience with atropine, as recommended by Opitz, nor with parasacral anesthesia, but believes the best results have been obtained with intravenous injections of Afenile, the urea salt of calcium and chlorine.

LITTLE.

Young: Dysmenorrhea. New York Medical Journal, 1921, cxiv, 395.

True dysmenorrhea, not dependent on gross pathologic lesions, may be due to a deficient ovarian function or an insufficient uterine musculature. In the first case, a lack of endometrial hormone causes a profuse clotted flow, with pain on attempted expulsion of the clots, even with a normal myometrium; in the second case, the pain is the result of a muscular spasm of the wall, the result of an effort on the part of the uterus to perform its function. Changes in the uterine wall causing circulatory stasis may be due to a lack of development, an inactive muscle degenerating and a lymphangitis from infected cervical glands. Flexions and the fibrostenotic cervix are but later developments of this latter pathologic condition and the operation of dilatation and curettage for their relief is far too frequently done. Relief of the unoffending endometrium does no good and the fibrotic cervix is sure to recontract. Relief in certain cases of muscular insufficiency by the stem pessary and the usual relief after childbirth are both due to the development of the myometrium. Dilatation of the cervix is only a secondary result.

To aid development of the myometrium, the author has devised an instrument (a suction syringe to be applied to the cervix), which he describes in detail. This produces rhythmical uterine stimulation and at the same time hyperemia and is an application of the principle of Bier's hyperemia to the uterus. He has employed it for a year with satisfying results.

MARGARET SCHULZE.

Cremer: Pemphigus Menstrualis. Nederlansch Tijdschrift voor Verloskunde en Gynaecologie, 1922, xxviii, 1.

Cremer discusses at length the various forms of skin lesions and the relation which some of them bear to the nervous and genital systems. He discusses more especially those lesions which occur in connection with menstruation and pregnancy, as well as the various theories advanced as to their causes. He is inclined to explain them on an anaphylactoid basis. Two cases of what Duhring termed dermatitis herpetiformis bullosa are reported.

R. E. WOBUS.